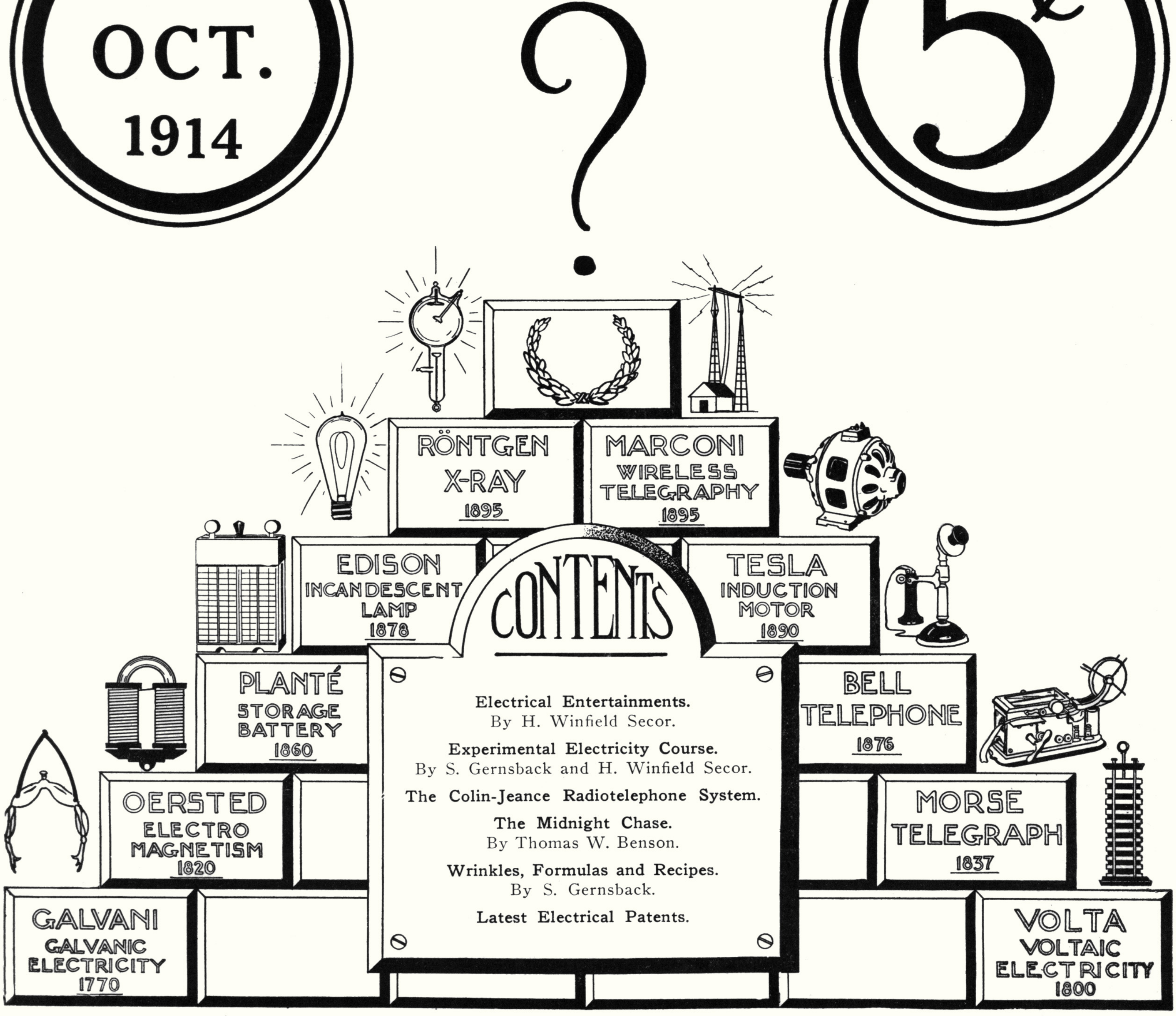
“ELECTRICAL ENTERTAINMENTS” IN THIS NUMBER

THE
ELECTRICAL EXPERIMENTER

OCT.
1914

5¢


RÖNTGEN
X-RAY
1895
MARCONI
WIRELESS
TELEGRAPHY
1895
EDISON
INCANDESCENT
LAMP
1878
CONTENTS
TESLA
INDUCTION
MOTOR
1890
PLANTÉ
STORAGE
BATTERY
1860
BELL
TELEPHONE
1876
OERSTED
ELECTRO
MAGNETISM
1820
MORSE
TELEGRAPH
1837
GALVANI
GALVANIC
ELECTRICITY
1770
VOLTA
VOLTAIC
ELECTRICITY
1800

Electrical Entertainments.
By H. Winfield Secor.

Experimental Electricity Course.
By S. Gernsback and H. Winfield Secor.

The Colin-Jeance Radiotelephone System.

The Midnight Chase.
By Thomas W. Benson.

Wrinkles, Formulas and Recipes.
By S. Gernsback.

Latest Electrical Patents.

“THE EXPERIMENTER’S MAGAZINE”

H. GERNSBACK, Editor **H. WINFIELD SECOR, Associate Editor**

THE ELECTRICAL EXPERIMENTER

VOL. II OCTOBER, 1914 NUMBER 6

Electrical Entertainments

By H. Winfield Secor, A. M., I. R. E.

THIS article has to deal with tricks for electrical entertainments which are readily performed by amateur electricians, and it is possible that wireless clubs, etc., can give a very nice entertainment in this way during the winter months, and by charging a reasonable admission realize considerable revenue from same to help them.

Our first electro-magical experiment consists of that employing one of the E. I. Co. detectiphones, or dictagraphs as they are commonly known, for the purpose of giving an imitation of mind reading acts and such acts as those where a gentleman passes thru the audience and invites anyone to whisper to him, the name of a certain piece of music they desire played; whereupon his lady assistant on the stage at once proceeds to play the piece selected by the member of the audience, which of course, seems very mystifying. The dictagraph is employed by many vaudeville performers and others traveling throughout the country, for this act. Just how this arrangement works out, is evident by looking at Figures 1 and 2. As seen from Figure 1, the detectiphone transmitter and battery perhaps, are placed on the breast in an inside coat pocket or a vest pocket, and the two wires leading from same are conducted down underneath the clothes to the heels of the shoes; where, as shown in the detailed sketch, these wires connect with a couple of screws threaded into the heels of the shoes and pointed sharply so that they will readily penetrate an ordinary piece of carpet.

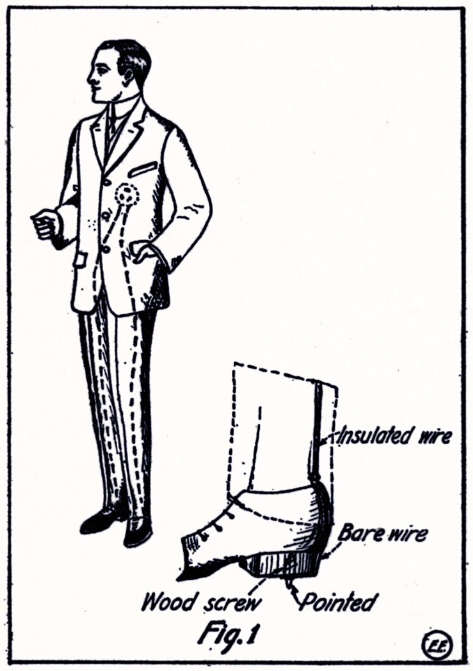


Fig. 1

Now, looking at Figure 2, we see that a series of square metal plates, or this may be metal ribbon about 2 in. wide, is placed under the carpet down the aisle and with each metal ribbon or series of plates there is connected one wire of the circuit which passes back to the stage in a well concealed manner of course, and on the stage these wires terminate in two metal plates near where the lady assistant is to sit. She wears the detectiphone receiver and headband well concealed in the hair, and two wires from same lead down under her dress to a couple of sharp pointed screws placed in the heels of her slippers, similar to the arrangement as shown in Figure 1, in detail. It is now readily seen that if the gentleman wearing the detectiphone transmitter passes down the aisle, and stands properly, so that the points in the heels of his shoes make contact with the metal plates in the aisle, that any song whispered to him by any of the audience will be readily picked up by the transmitter of the detectiphone in his coat pocket, and be at once transmitted to his lady assistant on the stage. In this way she rarely ever makes a mistake in playing quickly and correctly the musical selection whispered to her assistant by the person in audience.

A very interesting and simple trick is known as the Magnet and the Onion trick. An ordinary bar-magnet is shown and passed around for examination; it is then demonstrated that the magnet is a genuine one by its ability to hold up a steel key, etc. A brief discourse is then given on the popular belief current in southern Europe, more especially along the shore of the Mediterranean, that if a magnet be rubbed with an onion, or even brought into contact with the smell of it, it loses “pro tem” its magnetism; while a compass thus treated will mislead the steersman. As a proof that this belief is not without foundation, the experimenter, holding the bar-magnet in his left hand, with the key hanging from the opposite pole or end, picks the onion up with his right hand and proceeds to rub the magnet with it, with the result that the key very quickly falls off.

If a piece of iron, such as a key for example, is supported by a magnet, and we bring near it a second magnetized bar in such a manner that the poles approaching one another are contrary, then the key will remain supported so long as the poles are at a distance; but when they are sufficiently near, the key drops just as if the magnet which supports it had lost all its magnetism. This is not the case, however, for the key could be again picked up by the first magnet if the influence of the second were removed. The experiment well shows the opposite action of the north and south poles.

The only further explanation necessary, if indeed it be necessary, is that the onion has a magnet concealed within it of course.

The magnet holding up the key should only be just strong enough to hold it up. As long as one rubs the far end of the magnet with the onion, nothing will happen. A little experiment is necessary to get the best result.

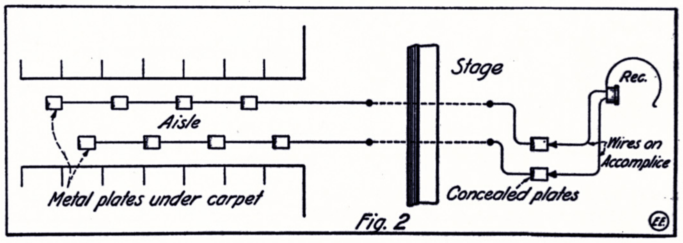


Fig. 2

An electrical stunt which has been performed at many electrical shows, and which also requires by the way, considerable alternating current, is that shown at Figure 3. This trick consists in frying eggs in a pan placed on top of a cake of ice, and as will be evident from the Figure, a powerful alternating current coil with laminated iron core, is placed underneath the ice, and when it is energized it by electromagnetic induction induces a powerful current in the metallic

“The Electrical Experimenter” is published on the 15th of each month at 233 Fulton Street, New York. There are 12 numbers per year. The subscription price is 50 cents a year in U. S. and possessions, as well as Canada. Foreign countries 75 cents a year. U. S. coin as well as U. S. Stamps accepted (no foreign coin or stamps). Single copies 5 cents each. A sample copy will be sent gratis on request. Checks and money orders should be drawn to order of the Electro Importing Co.
If you change your address, notify us promptly, in order that copies are not miscarried or lost.

All communications and contributions to this journal must be addressed to: Editor, “The Electrical Experimenter,” 233 Fulton Street, New York. We cannot return unaccepted contributions unless full return postage has been included. ALL accepted contributions are paid for on publication. A special rate is paid for novel experiments; good photographs accompanying them are highly desirable.

Title registered U. S. Patent Office. Copyright 1914 by E. I. Co., New York.

body of the frying pan, which should be of copper. This in turn gets very hot, thus frying the eggs. For amateur experimenters the ice may be substituted by a piece of glass about 1 in. thick or less, etc. The iron wire core should be 2 in. by 2 in. square and about 10 in. long, wound with a considerable amount of heavy copper wire so as to give a powerful field when excited by a 110 volt A. C. circuit, etc. As seen the wires from the magnet are led down back of the legs of the table or inside of them, to metal points at their feet, etc., to make contact with plates under piece of carpet, if desired.

Looking at Figure 4, we have illustrated what is known as the magic baton. This is very easily made up of a piece of hard wood drilled out inside of it to accommodate a couple of small flashlight batteries, which measure about 7/16 in. by 2 in. each and a secret push button is placed in the end held by the magician. At the other end is placed inside of the baton a powerful electro-magnet coil with iron core and one end of this core bends downward and so fits into the wooden rod that only about 1/32 of an inch of wood is left between it and the outside surface. A glass or bronze gong is looped onto the end of the baton by a little strap, as shown, and all that is placed inside of the bell is the small iron armature and pivot to which is attached a clapper and of course it is so arranged that the clapper cannot fall much more than 1/16 to ⅛ of an inch back from the bell gong. Whenever the secret push button is pressed by the magician, he closes the battery circuit thru the electro-magnet, which, being sufficiently strong, very easily attracts the iron armature of the bell and rings it of course.

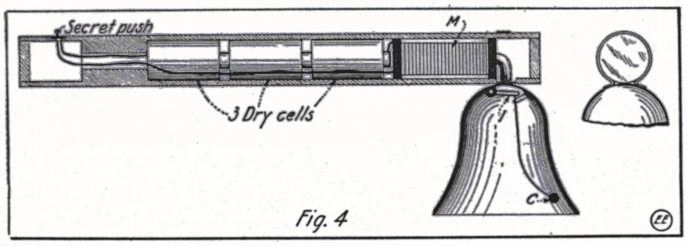


Fig. 4

The bell can readily be passed among the audience without exciting any suspicion. The baton should be very neatly made indeed, for proper satisfaction, and if made of hard wood or ebony the end may be simply plugged with similar material plugs. With proper care the baton need not be made over ⅝ of an inch in diameter. The push button, if carefully adjusted, can be arranged so that a thin shell of the baton wood is left over it and by pressing over this spot with the finger, the wood will give sufficiently to actuate the push, which may be home-made or purchased. The electro-magnet may be round with about No. 20 to 22 magnet wire, and a little experimenting will give the desired results in this direction.

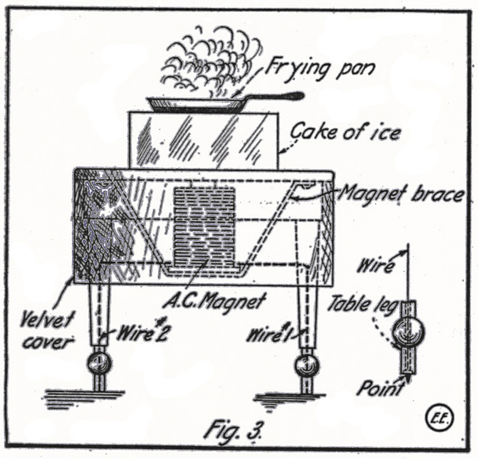


Fig. 3.

RADIO FOG PROTECTION FOR SHIPS.

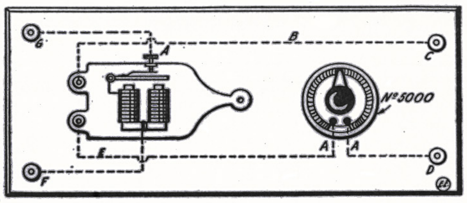
The United Fruit Company has awarded to the Marconi Company a contract for the installation of wireless direction finders on the steamships Pastores, Tenadores and Calamares. These steamships will be the first passenger vessels in the world to be equipped with an invention which, it is asserted, will greatly reduce the risk of collision in fog.

The object of the wireless direction finder is to enable navigating officers on ships to take bearings of wireless telegraph stations with a view of finding the position of their ships or of avoiding collision with other vessels. It is not asserted that bearings taken with this instrument exceed in accuracy those taken with optical instruments under good conditions, but it is maintained that reliable bearings may be taken with it when direct bearings cannot be taken owing to bad weather.

ELECTRIC BELL SHOCKER.

The materials used are, a bell with the clapper and gong taken off, a No. 5000 "Electro" Rheostat, four binding posts taken from the carbons of old dry batteries, and a wood base, 8" by 12" and ½" thick.

The bell and Rheostat are first fastened to the base; then six small holes "A" are bored to allow the wires to come from the bottom of the base; then the wire "B" is run from the first Binding Post on the bell to the Binding Post "C." Then another wire from a Binding Post of the Rheostat, to binding post "D"; then wire "E" is run from the other binding post to the bell to the other binding post of the Rheostat. Also a wire runs from the iron yoke of the magnets to binding post "F," and a wire is fastened to the thumb screw or contact point on the bell to binding post "G." This shocking coil is very inexpensive and does just as good for amusement as an expensive medical coil. The thumb screw can be adjusted and the strength of the current can be regulated by the Rheostat, Two or more batteries are fastened to binding post "C" and "D" and wires running from posts "F" and "C" to carriage bolts or 12 gauge cartridge shells, fastened to the ends of the wires make good electrodes.



Contributed by HARRY DUNN.

NEW JAPANESE THEORY OF MAGNETISM.

In a paper read before the Tokio Physico-Mathematical Society in April, which appears in the June number of the science reports of the Tohoku University, Professor K. Honda puts forward a new theory of magnetism which appears to follow the experimental facts more closely than any previous theory. It is based on the following assumptions. The molecules, or in a solid, the molecular groups, which are in thermal agitation, have magnetic moments which are functions of the temperature. Their action on each other is due partly to actual impacts, partly to the magnetic field each sets up in its neighborhood. In general the second effect is small compared with the first. When an external field is applied, both the impacts and the molecular fields tend to oppose the rotation of the magnetic axes of the molecules or molecular groups into line with the field. If the molecules or groups are elongated in shape the impacts almost entirely prevent rotation and the substance is paramagnetic. If the molecules or groups are spherical the impacts have only a small effect, rotation is resisted mainly by the mutual magnetic actions and the substance is ferromagnetic. Diamagnetism he considers to be atomic in nature and only another aspect of the Zeeman effect.

Wireless towers and flag stations have been constructed at Camp Philip, Mount Hope, by the Signal Corps of the Rhode Island Boy Scouts, now encamped there. The work has been completed by a squad consisting of Chief Operator Isaiah Creaser, First Operator Gilbert Johnson, Second Operator Don C. Thorndike, First Signalman W. Borelester, Second Signalman J. Palmer, First Receiver L. R. Mitchell, Second Receiver A. Crocker and Assistant Radio Operator C. I. Gamble.

PENDULUM HUNG TO MAGNET SWINGS LONG.

When the pendulum of a clock is not stimulated by anything but its own momentum it gradually slows down. This is due to the resistance of the air and to the friction of its bearings. Some pendulums hang from a knife edge on a base of polished agate, others hang from a supple spring. In the former case the friction is very slight, in the latter there is no friction, but its place is taken by the resistance of the spring. In both cases it is sufficient to bring the pendulum to a stop sooner or later.

According to Cosmos the ideal articulation for a pendulum is suspension from a magnet. That scientific journal says that a pendulum 11¾ inches long beating every half second, its stalk sharpened to a knife edge and hung by a needle point from one of the poles of a magnet, swings fifteen times as long as an ordinary pendulum and will take sixteen hours to come to a stop. Such a pendulum hung by a knife edge from a block of agate will stop in from 50 to 60 minutes.

This magnetic suspension has been used in instruments of precision.

Experimental Electricity Course

By S. Gernsback and H. Winfield Secor

LESSON 14.

HIGH FREQUENCY CURRENTS (Concluded).

High frequency currents can be produced in several ways, the principal methods being those involving the use of an Elihu Thompson generator, a Fessenden high frequency dynamo, or by means of the Tesla disruptive discharge set. The latter is the commonest and easiest method of producing such currents, and is widely utilized for lecture work, electro-therapeutics, exciting X-Ray tubes, etc.

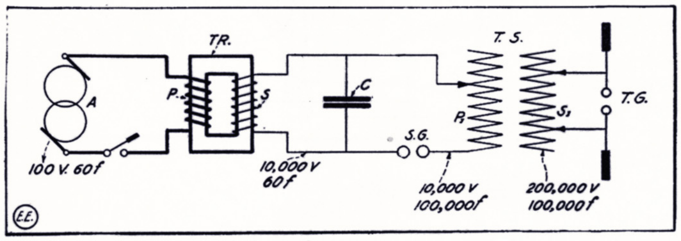


Fig. 4

The general arrangement of the functional parts composing the complete set is outlined in fig. 2.

Referring to the diagram, I is an induction or spark coil, preferably of not less than 2" spark capacity. T is an air-core transformer, which serves the purpose of stepping up the voltage of the current delivered by the secondary of the induction coil, to many times its original value. At C is a condenser composed of Leyden jars, or glass plates, coated on both sides with tinfoil. A spark gap is placed at S G between whose electrodes the disruptive discharge of the condenser takes place. G is the discharge air gap of the Tesla coil secondary, across which the high frequency oscillations surge.

The functions of the various parts of the apparatus and their inter-relation is as follows: The induction coil or transformer I is excited from the battery shown at B, or the regular line feed wires; and its secondary current at 10,000 volts or more pressure is caused to charge the condenser C, which immediately discharges itself thru the primary coil P of the Tesla transformer and the spark gap SG. Now due to the conditions imposed by such circuit, the condenser discharge becomes not a single discharge for each cycle of induction coil secondary coil, but many times greater; so that with certain proportions to the circuits, as regards the capacity and inductance, the frequency of the current passing thru the Tesla coil primary may easily reach a million and more cycles per second; rendering the current harmless owing to the "skin effect" already mentioned. The currents thus produced are of course highly damped, i. e., the series of oscillations corresponding to each cycle of exciting current, dies down to zero, before the next series of oscillations start.

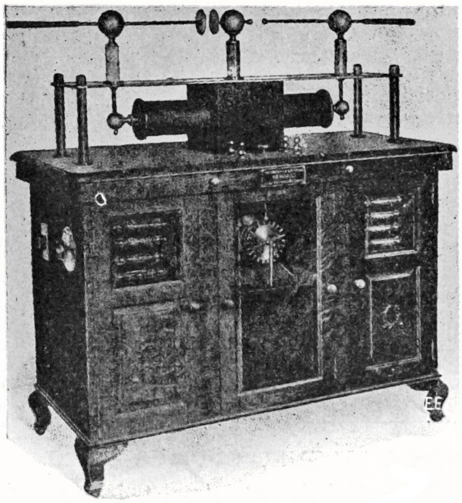


Fig 5

The frequency of the Tesla currents produced obey a certain law, which is as follows: They vary as the square root of the product of the capacity and inductance in the closed oscillating circuits. The frequency in cycles per second is found by dividing 10^6 times 5.033 by the square root of the capacity, multiplied by the inductance; where the capacity is in microfarads, and the inductance in centimeters. For further particulars see "Wireless Course" chapters 17 and 19. Also "Construction of Induction Coils and Transformers," by H. W. Secor.

Another form of high frequency transformer employed extensively for electro-therapeutical applications, is the Oudin coil. Its appearance and connections are given at fig. 3. As seen the bottom of the primary and secondary coils are joined together. Any Tesla coil becomes an Oudin type, if the primary or heavy wire winding is simply placed at the end of the secondary, instead of at the center as usual.

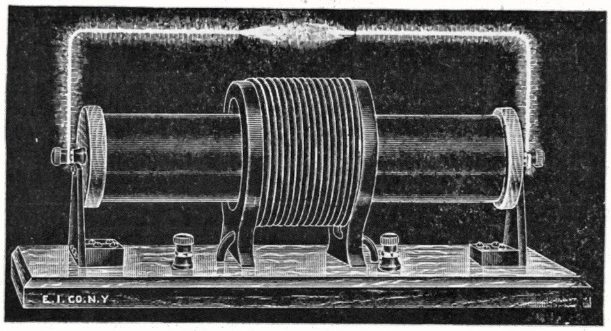


Fig 6

The relation of the frequencies and voltages will be more readily understood quite probably by inspecting fig. 4. It is seen that the coils or transformers do not change the frequency in themselves at all but only the voltage, which is dependent upon the relative amount of turns of wire upon the different coils. (See Lesson No. 4 in Nov., 1913, *Electrical Experimenter,* on "Transformers.") A cut of a powerful high frequency generator designed by Dr. Frederick Strong, for electro-therapeutical purposes, is illustrated by fig. 5.

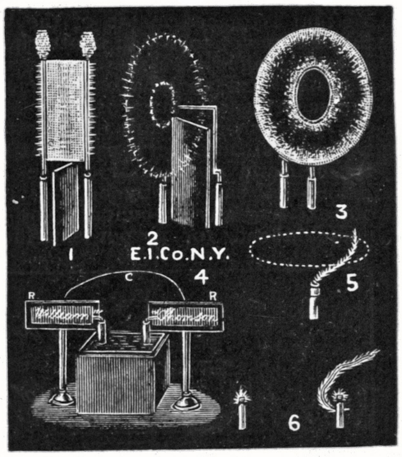


Fig. 7

For experimental research a very neat and efficient form of Tesla transformer is depicted at fig. 6. It is built by the well known electrical firm, The Electro Importing Co., of New York City, and sells for a very reasonable price, in comparison to the wonderful results attainable with it. In full activity, when excited from a 2" spark coil operating on batteries, it takes on the appearance displayed in fig. 6, but the life and beauty of the discharge can only be fully appreciated by actual observation, and not from a mere black and white print. This coil is admirably suited to the requirements of the private laboratory, the School lecture platform, and demonstrations in general. A larger exciting coil may be employed than that mentioned, and of course the effect is greatly enhanced. (See the Feb., 1914., E. E. for a special article on "Currents of Ultra-High Frequency and Potential.")

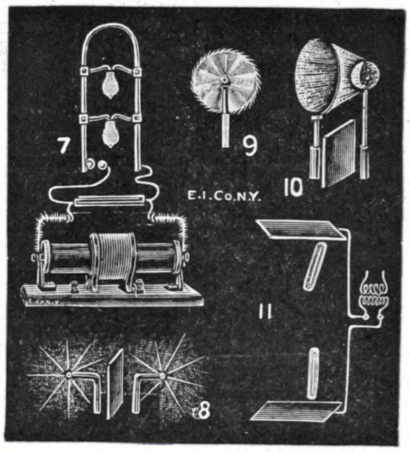


Fig. 8

The adjustment of the circuits of Tesla or Oudin coils has to be carefully tried out by experiment to attain the maximum results. The length of the spark gap, the amount of condenser capacity and number of Tesla coil primary turns in circuit, all have a direct influence upon the final high frequency discharge, and they should be carefully adjusted simultaneously or successively, until the best high frequency discharges are obtained.

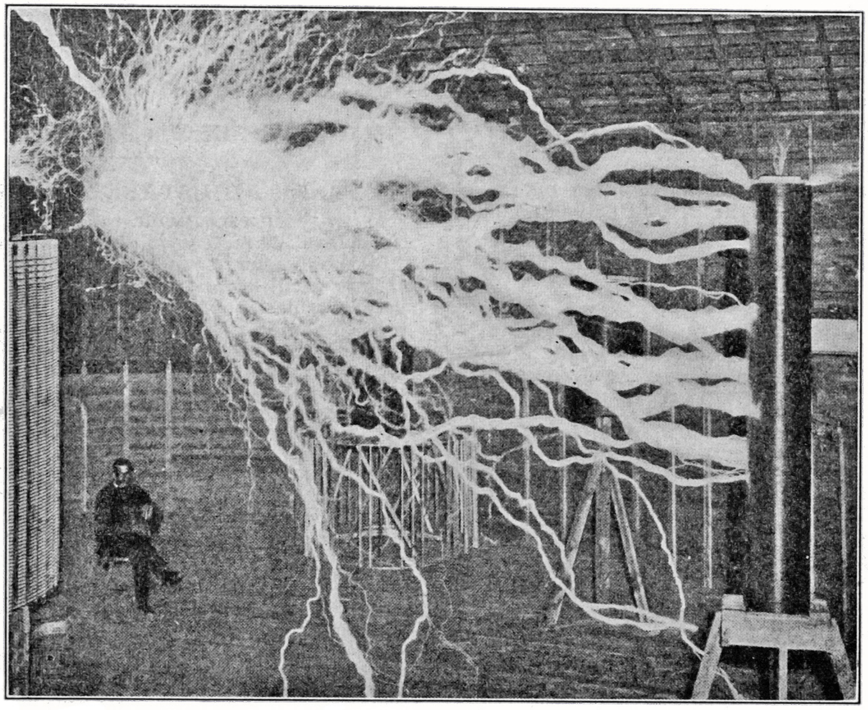


Fig. 9

A rotary spark gap is best for the oscillating circuit, as it keeps very cool, and prevents the gap from arcing, which lowers the frequency. The shorter the gap the higher the frequency, and vice versa.

Having described the Tesla transformer, its action and connections, a few experiments of interest will be given: It may be well to state that the most spectacular results are only obtainable in a good dark room or hall. When the high frequency current is to be handled by the body, an unpleasant shock is experienced if the Tesla spark is allowed to jump direct to the skin; and a piece of metal held in the hand, or a Geissler tube, or even an incandescent lamp is best; the brush or spark being absorbed by them, and communicated to the body without shock. Geissler tubes and the like are very useful for demonstration, as whenever the discharge is absorbed thru them they light up brilliantly, making visible the great activity occurring. Several people may be placed in a circle and a Geissler tube placed in the hands of every couple. When the current is applied to the persons at the ends of the circle, the Geissler tubes all way around will simultaneously light up, making an impressive effect.

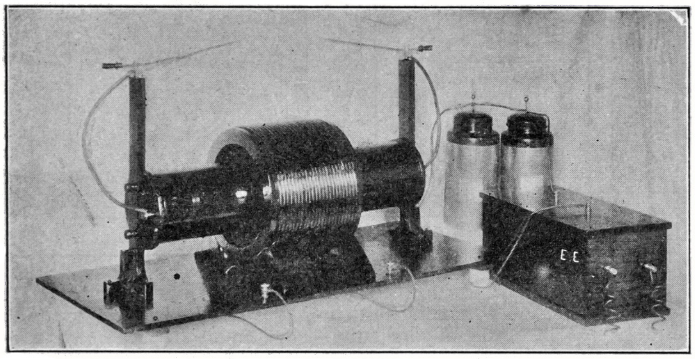


Fig. 11. A Large "Electro" Tesla Coil

In Fig. 7 are shown a number of interesting experiments which can be performed with the Tesla coil illustrated in fig. 6. At 1, fig. 7 is an experiment requiring the use of two vertical copper wires as nearly parallel as possible. When the apparatus is working in good shape, with the frequency high, the space (2-4 inches) between the two wires is filled with light, while the ends show a heavy brush discharge.

The experiment seen at 2 is performed by arranging two loops of copper wire, and attaching them to the secondary terminals of the Tesla coil. A similar arrangement is that seen at 3, but here the inner loop is 30 centimeters in diameter (1 inch equals 2½ cms.), while the larger loop is 80 centimeters in diameter. The space between the concentric loops is filled with millions of fine sparks, presenting a very pretty effect.

Illuminated names are produced as shown at 4, fig. 7. The names are made of fine copper wire, placed on one side of glass plates. The backs of the glass plates are coated with tinfoil a little smaller than the glass itself. One terminal of the Tesla secondary is connected to the wire name, and the other terminal to the opposite wire name. The tinfoil coatings on the back of the glasses are connected together by a piece of copper wire. When the current is turned on the names are illuminated. Hard rubber may be employed in place of the glass.

The rotating wire, 5, at fig. 7, is very amusing to observe. The wire must be quite fine, and the length determined by experiment. When of the right length, the wire will swing around a circle continually. It is connected to one terminal. A short piece of thin, cotton covered copper wire when attached to one terminal of the coil, gives out a beautiful flame effect, seen at 6.

Fig. 10. Tesla's "World Wireless" Tower on Long Island, N. Y.

One of the most astounding stunts performed with high frequency, high potential currents, is that known as "The impedance bridge or shunt," seen at 7, fig. 8. A heavy piece of copper wire or brass rod may be bent into a U-shape as shown, and when shunted by a low voltage lamp bulb, the lamp will light up brightly; the high frequency current preferring to traverse the comparatively high resistance path of the lamp instead of the low resistance offered by the brass rod. This is

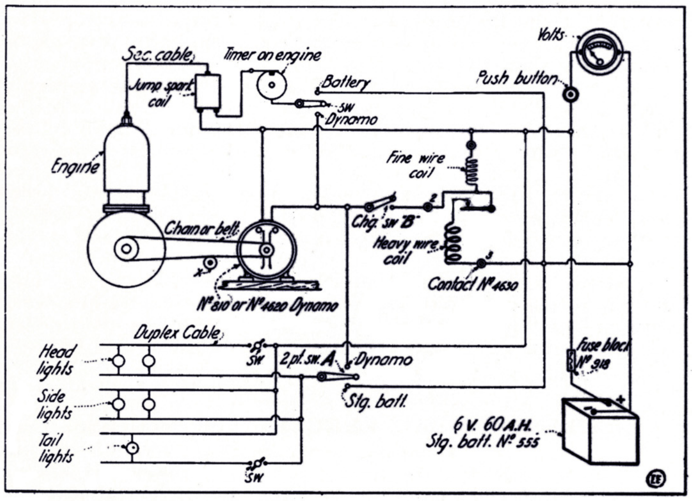
(Continued on page 87)

THE CONSTRUCTOR

AUTOMOBILE LIGHTING PLANTS.

Practically all makes of automobiles to-day are equipped with electric lights, and one of the cheapest outfits capable of giving first-class results is that supplied by the E. I. Co. for this purpose. A complete lay-out of such a plant comprising E. I. Co. goods is shown in our diagram.

As will be seen, one of their 8 volt 10 Amp. or 8 volt 19 Amp. dynamos is arranged for belt or chain drive from the automobile engine, and if this drive is a short one, utilizing a leather belt, it is advantageous to use an idler pulley at the point shown to insure the greatest arc of belt contact on the engine and dynamo pulleys. For the No. 810 dynamo about one-half inch belt width is sufficient, and a one-inch belt width should be used for the No. 4620 8 volt 19 Amp. generator. Both of these dynamos, of course, supply direct current, which is suitable for charging storage batteries such as the "Electro" No. 555 type, rated at 6 volts and 60 A. H., and it is quite advisable to use two of these storage batteries connected on parallel in this case, and the positive terminals of each battery are connected together.



Schematic Layout of Auto Lighting Plant

The rest of the circuit as shown requires but little explanation. The Automatic Charging Cut-Out No. 4630 is connected in the circuit as indicated, to prevent the battery from discharging back through the dynamo; whenever the voltage of the latter drops below normal, which, of course, occurs frequently on this class of service; owing to the fact that the speed of the automobile engine, and consequently the dynamo voltage is constantly fluctuating. The two point switch, shown at "A," may be utilized so that in an emergency if the storage battery fails, the lamps may be switched onto the dynamo direct, but this should not be done regularly, as at times the dynamos will generate consideraby too much voltage for the lamps, which is liable to burn them out. As aforesaid, this is usually utilized in an emergency, as is well known to the average motorist from experience. A two point switch is also arranged in the primary circuit of the jump spark coil, used for igniting the gas in the engine, so that this coil may be switched onto the dynamo directly or onto the storage battery, and the usual way is to connect the spark coil to the dynamo when the engine has been started up, and the battery point of the switch is used only when starting the engine from rest. Once the engine is speeded up to normal, this primary switch can be quickly thrown from the battery point to the dynamo or steady running point. The battery charging switch "B" should be opened when the battery has become fully charged, which fact is ascertained by measuring the voltage as indicated on the voltmeter connected in the circuit, as shown with the push button or switch, and this instrument is not to be left in the circuit continuously. The usual precautions and care should be given the storage battery, of course, and this matter is covered in detail in the "Treatise on Storage Batteries," supplied gratis by the E. I. Co. to any one interested. The lamps used for this system should be 6-volt Tungsten ones, and switches can be arranged in each lamp circuit if desired, or as indicated in our sketch, one switch, such as at "A," may control all the lamps.

All of this apparatus is fully described and illustrated in the new E. I. Co. catalog No. 14 which is just off the press. Anyone owning an automobile of the gasoline or steam type can easily fit one of these electric lighting plants on same with a few tools and at small cost. All of the wire, etc., with full directions, including blue-prints, etc., are furnished by the E. I. Co., and the cost of the whole outfit does not exceed $45.00 to $50.00, which is much lower than most plants of this type on the market, which cost on the average from $100.00 up to $175.00.

ROTARY ADJUSTABLE VARIABLE CONDENSER.

With the present wide range of wave-lengths, viz., Arlington with 2500 meters and amateurs below 200 meters, the variable condenser is an indispensable instrument. If no variable is used, large tuners are necessary and these are in the way, besides fine adjustment with large tuners, especially loose couplers, is almost impossible.

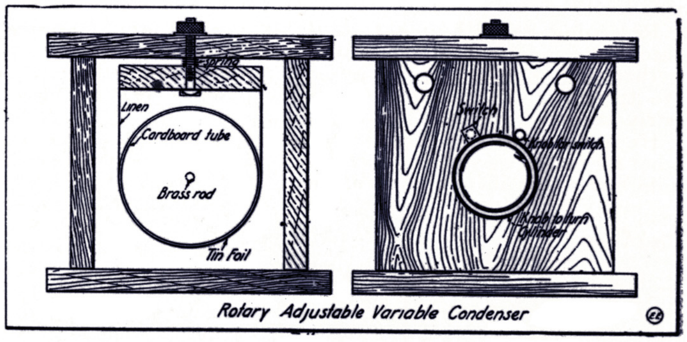
A medium size loose coupler and two good variables are a fine substitute for a large coupler. Variables, however, are very expensive instruments for most amateurs. The following description and illustrations are of one used by the writer for several years with good results. Besides the simplicity which can be seen from the drawings, the cost is very low.

The drawings show clearly how it is constructed, but a few words might not be amiss. No dimensions are given as that is left entirely to the maker. The one made by the writer had a tube three inches in diameter and six inches long.

The tube should be soaked in wax for some time to harden it. A piece of tinfoil should then be fastened on one-half of the tube, that is, on one side of a diameter and over this is pasted a piece of oil paper or silk.

At a place, equidistant from the ends of piece of oiled linen or silk of sufficient length, are pasted on either side of the cloth, pieces of tinfoil of the same size as that on the cylinder.

A box of suitable size should then be made of hard wood and also a piece of wood, the length of which is slightly less than the inside of the box, and the width, the same as the diameter of the tube. Holes should be drilled in this piece about one inch from either end and equidistant from the sides, and corresponding holes in the top. Screws are put in these holes through the odd piece and double pointed tacks driven in the slot in the top of the screws.



Rotary Adjustable Variable Condenser

In the front of the box a hole should be made for the axle of the cylinder, which is held in place by two round wooden blocks in the ends of the tube—care must be taken in centering the holes for the axle. A hole, corresponding to the hole in the front, should be made half way thru the back of the box.

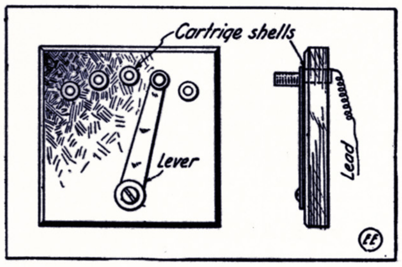
A two point switch is necessary, the points of which are connected to the two binding posts on the box. This switch should be conveniently placed, and the best way to do this is as in the drawing, viz.: let the knob of the switch and the knob to turn the cylinder have the same center.

The foil on the tube is connected thru the axle to one of the binding posts; the foil on the inside of the linen is connected to the other binding post, and the foil on the outside is connected to the switch arm. This switch is left to the maker, as is also the knob for the cylinder axle.

The instrument is now assembled, the adjusting nuts are tightened so that the tube just revolves easily, the linen being as close as possible to the tube. Instead of this adjusting device, the linen may be merely tacked to the top of the sides after being drawn taut. Tinfoil, binding posts, switch parts, knob, etc., obtained from E. I. Co. The condenser is a valuable adjunct to the amateur radio man.

Contributed by FRANK H. BROOME.

NOVEL SWITCH POINTS.



In making small switch boards, I found a good use for old center fire cartridge shells as shown in sketch. A hole a little smaller than the shell is made in the board, then the shell is forced in it. The proper wire is then soldered to one side of the shell or fastened by some means so as to have a good connection.

Contributed by FRED STEVENSON.

THE MIDNIGHT CHASE.

By Thomas W. Benson.

ONE evening as the Wizard was walking slowly down the street, he noticed a dog approach a metal trolley pole, sniff it, and jump back with a yelp. Curious to know why the dog behaved in this manner, he went up to the pole and laid his hand on it, only to feel a tickling sensation caused by a mild electric shock.

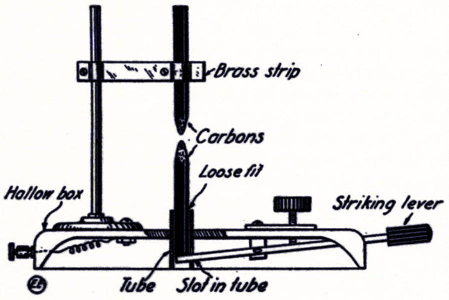


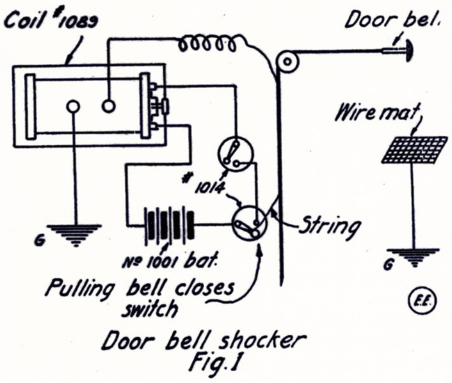
Fig. 1A

Still curious he fished a short piece of copper wire from his pocket and inserting one end in the ground he touched the other to the pole and got a fairly good sized spark. Replacing the wire in his pocket he rose to his feet and stood looking at the pole.

It did not strain his intellect to any extent to deduce that the insulator on the trolley wire was broken, and was allowing quite an appreciable amount of current to leak to the pole, and he decided to determine roughly just how much was leaking.

Returning home he went to his laboratory and taking a satchel he put in it an arc lamp, and a few feet of wire, together with a screw driver and pliers, and snapped it shut. He turned to his wireless set and started to call a friend, fairly jamming the ether in his anxiety.

He got a reply in a few moments via radio and explained what he had seen to his friend Paul, receiving his promise to help him to conduct an experiment with the arc light. Eleven o'clock that night found two whispering figures doing some mysterious tinkering and a policeman noticing them, decided to watch and see what they were up to.



Door bell shocker
Fig. 1

Fastening a wire to the pole and running it to one side of the arc lamp, and connecting the other side of the arc with a wire that was inserted into the ground, about 2 feet from the trolley track, completed the wiring. Everything ready the Wiz. struck the arc by depressing a lever, and they were fairly enveloped in the brilliant glare.

"Some Arc. Believe me," ejaculated the Wiz; "I didn't think there was enough juice to light it." "Give it some more and see what happens," suggested Paul.

"Alright, put that wire direct on the trolley track," and immediately a connection was made. Again the Wiz. reached for the striking lever, and hesitated for a minute, and well he might, for 550 volts is no joke when turned loose into such a contraption; but he placed his finger on the lever, and struck the arc.

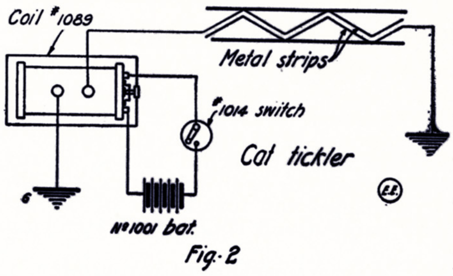


Fig. 2

Click-nip-sh-h-h-spisst! and they would have sworn lightning had struck them, for nearly blinded by the glare, they were enveloped in a rain of sputtering copper, as the wire had fused and was flying in all directions, and the carbons of the arc were sizzling hot for an inch either side of the arc proper, although it had been lighted but a moment. The police officer decided it was time to act and his footsteps as he ran towards them started them to action also. "Get the satchel, I'll attend to the arc," said the Wiz. as he seized it and started after Paul, the "bull" in full pursuit.

They were just holding their own when a light suddenly dawned on the Wiz.; "Down this alley, quick, Paul, take the end of this wire and you run to the right and I'll go to the left and stretch the wire across the alley and let him trip over it."

No sooner said than done, and a poor unsuspecting "bull" came sprinting down the alley while the two friends braced themselves, holding the wire taut about a foot above the ground.

A shock, a grunt and a figure was seen half flying, half sliding, across the street. Like a flash the two friends were running back up the alley, but the temptation was too great, and they stopped at the other end to see the result of their

(Continued on page 88)

EXPERIMENTAL ELECTRICITY COURSE.

(Continued from page 85)

probably similar to lightning effects, etc., where it is seen that such high frequency surges, tend to take the shortest path, irrespective of resistance. For this reason lightning rods are always run in as short and straight a path as possible, avoiding sharp bends. In the Tesla coil experiment here mentioned, a Leyden jar or other condenser is connected across the secondary coil terminals, with a spark gap in one of the leads going to the copper bar. The terminals of the 20 volt lamps are tried in different positions, until the maximum brightness is obtained.

At 8, Fig. 8, is a display of weird appearance, called the "Electrical Phantom." Two thin metal discs, about 1" diameter, are connected to the two secondary terminals of the Tesla Transformer. Their edges are ground thin. With the voltage at a high value, white rays or threads of light strike out from the edges of the discs, which are sometimes of considerable length.

Electrical wind, as performed with static machines, is also reproduceable from the Tesla coil. Its effect is illustrated at 9. A small sharp toothed aluminum disc, about 1/64 inch thick, is mounted on an axle, having very little friction, and when the current is turned on, the little disc will rotate at high speed, becoming enveloped in sparks.

An illuminated cone of light is made by having a wire ring connected to one terminal of the Tesla coil and a metal ball of ¼ the ring diameter, connected to the other terminal. When current is applied the space between the ring and ball is filled with multitudinous fine sparks, giving a unique and beautiful display.

At 11 is depicted Nikola Tesla's ideal wireless light for illumination. Evacuated glass tubes are placed in proximity to the charged metal plates, connected to a source of high frequency, high potential electric current. The lamps are thus illumined by induction, without any metallic connections whatever being made to them.

Just what can be accomplished when large amounts of electrical energy is transformed into high frequency, high potential form, may be gleaned from the photograph of some electrical discharges of this nature, at fig. 9. This is from some of Tesla's experiments. The sparks shown were 25 feet long, the potential several billion and the amperage 800. Tesla's laboratory and tower erected some years ago on Long Island, for experimenting with world wave telegraphy, is depicted at fig. 10.

(To be continued)

C. A. Hohlbein, Seattle, Wash., says:

"Received my order O. K. The No. 8000 Interrupter is working fine. I thank you for prompt attention you gave my order. You may look forward to another order in the near future."

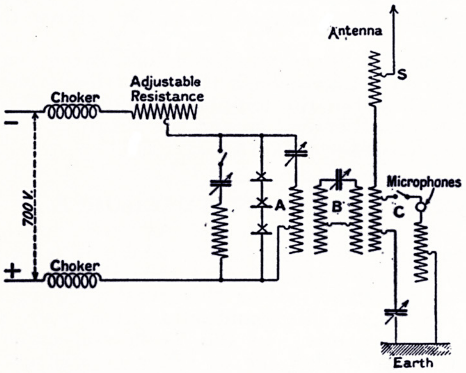
WIRELESS DEPARTMENT

THE COLIN-JEANCE SYSTEM OF RADIOTELEPHONY.

The continuous waves employed in this system are produced by three arcs connected in series, each arc having a carbon and copper electrode. The carbon electrode is of about 1.5 mm. in diameter and is attached to the negative pole. The copper positive electrode is in the form of a disc; this disc is very easily replaced and forms part of the base of a cylinder filled with paraffin and cooled by water circulation.

The arcs are "struck" in an atmosphere of carburetted hydrogen gas, which may, for example, be produced by mixing in correct proportions acetylene gas generated from calcium carbide and hydrogen generated from calcium hydride.

This process is carried out in a single generator, the gases being produced very conveniently in the correct proportions, and the result of burning the arcs in this atmosphere prevents any burning away of the carbon electrodes; in fact, they actually slightly increase in length. The arcs are controlled by separate regulators to keep the distance of the electrodes constant. Owing, however, to the composition of the gas in which they burn, only very slight variation occurs, so that the use of this hand control regulator is not really necessary. The supply voltage from the dynamo may be varied by shunt regulation from 500 to 750 volts, the current consumed varying from 3½ to 4½ amperes. From the diagram it will be seen that the current is led through choking coils and a steadying adjustable resistance. The voltage at the terminals of the three arcs in series, where the oscillatory circuit is tapped off, is from 250 to 350 volts. When the oscillatory circuit is broken in passing from transmission to reception, this voltage falls to approximately 150 volts, and a resistance is automatically inserted to compensate for this drop in voltage.



The principal oscillatory circuit consists of an inductance and variable condenser A connected in parallel with the arcs. An intermediate oscillatory circuit B consisting of an inductance and variable condenser is utilized to couple the principal circuit with the antenna and ensures that multiple waves generated in the main circuit are not transmitted to the antenna, the result being that only a single wave is emitted.

The antenna circuit consists of an inductance coupled with the circuit B and a variable condenser. A variable self-induction is also used in the aerial.

The microphone circuit consists of the nine carbon microphones connected in series and so arranged that they are all acted upon by the voice simultaneously by means of a megaphone. The microphones are connected between the variable inductance of the oscillation transformer and the earth as shown at C in sketch. This has the double advantage of avoiding sparking, such as always occurs in the microphones when they are placed directly in the antenna, and does not limit the antenna energy to that which can be taken by the microphones.

The station has two complete microphone circuits and two megaphones, a switch enabling one to change instantly from one to the other, so that the one not in use, should it become heated, has time to cool. In this way it is possible to talk continuously for an indefinite time without in any way overloading the microphones.

The station is also arranged for telegraphic transmission with a musical note, whose pitch may be changed at will. This is carried out by placing an oscillatory circuit having musical frequency across the arcs; this circuit consists of a condenser and variable inductance, the latter being changed by means of a multiple switch so that transmission may be carried out on any desired note. This arrangement is very valuable for transmitting messages during times of atmospheric disturbances. When employing this musical transmission signalling is carried out by cutting out the antenna.

All the transmitting coils consist of flat spirals of copper strip and the condensers are of the well-known glass plate type constructed by the Compagnie Generale Radiotelegraphique. The reception calls for no special comment, except that arrangements are provided for very exact tuning, C.G.R. variable air condensers being employed.

The wave-length of transmission can be readily varied between wide limits. From the official tests that have been carried out the following particulars are taken and will be of interest:

Supply voltage	650 volts
Supply current	4.2 amperes
P. D. across the arcs in series	350 volts
Antenna current	4.6 amperes
Antenna current with microphones in circuit	3.2 amperes
Current in the microphones	0.5 amperes
Wave-length	985 meters

With this system demonstrations have recently been carried out for the French Naval Authorities, and conversations have been carried on between Paris and Mettray, a distance of 200 km.—*The Electrician, London.*

THE MIDNIGHT CHASE.

(Continued from page 87)

headwork. The "bull" was just getting to his feet when he caught sight of the two, as they stood silhouetted against the well-lighted street. The contortions of the two, laughing, was too much for him and being game, he started after them again. All three being winded by this time, and the officer bruised in the bargain, the race lacked a little ginger. "Lag back a little and draw him on," puffed the Wiz.; "I'll fix him this time," as they drew near the Wizard's home.

The "bull" was drawing up close when they sprang into the doorway, jerked the door open and slammed it shut in the officer's face. "Now, watch him," panted the Wiz. as he closed a small switch in the hall.

Peering through the glass panel they saw him hesitate, then come up the steps three at a time, and take hold of the bell knob. He pulled it once, but only once, for the first yank brought a yell of terror from him, and he took a flying back jump onto the pavement, his hat flying one way and his club the other.

He looked again at the door, and then at his hand. He proceeded to pick up his club and sauntered down the street swearing softly, having made a mental note of the house number. "How did you do it?" asked Paul, after they had recovered somewhat from their fit of laughing. "A lead pipe cinch," replied Jim; "here I'll sketch it for you," and he rapidly drew the diagram we reproduce at Fig. 1. "I used the same coil that I used that night we played the tricks on Olga's beau; it's pretty convenient for discouraging hoboes, canvassers, cats, etc. "Cats?" interrogated Paul. "How in the name of Cleopatra can a cat pull that bell?"

"They don't have to," laughed the Wiz. at the puzzled expression on his friend's face. "I have a cat tickler on the back fence, wired up to the same spark coil. See those wires nailed along the top of the fence? Well sh-h! here comes a cat now; just watch him!

The feline came parading down the fence, unconscious of the two conspirators watching him from the window above. As he got fairly in the middle of the fence, a switch tanged as it shot home, and Mr. Cat yelled unmercifully as he shot about three foot into the air, landing in another yard, only to go screeching up on another fence and running rapidly down the alley. "Say, this is rich; give me a hook-up for that tickler, I'll surely have to make one," requested Paul, doubled up with laughter.

"Surest thing you know, here it is," replied the Wiz., as he drew another sketch resembling our fig. 2. "Be quite careful, though, Paul, as I happened to close the switch one day when our neighbor was leaning over the fence talking to my mother."

"I guess she went up in the air, alright?" queried Paul.

"Oh, sure, but she cooled off some, when she landed in a convenient tub of water," answered Jim.

"That 'bull' will lay for you now, Jim, and catch you off your guard," warned Paul.

"I should worry, I go to the country the end of this week for a month; you want to come out, Paul, and see me. I'll show you some real fun."

"Not much, unless Olga goes with you."

"What do you mean?" asked the Wiz., but he was answered by a laugh and the sound of a door closing with a bang.

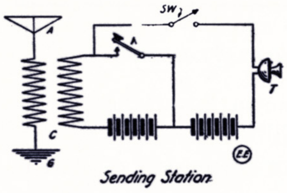
HOW-TO-MAKE-IT DEPARTMENT

This Department will award the following monthly prizes: FIRST PRIZE $5.00; SECOND PRIZE $2.00; THIRD PRIZE $1.00. The idea of this department is to accomplish new things with old apparatus or old material, and for the most useful, practical, and original idea submitted to the Editors of this department, a monthly series of prizes will be awarded. For the best ideas submitted, a prize of $5.00 will be given; for the second best idea a $2.00 prize, and for the third best a prize of $1.00. The article need not be very elaborate, and rough sketches are sufficient. We will make the mechanical drawings.

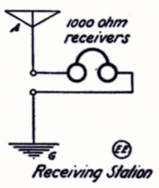
FIRST PRIZE, $5.00.
AN EXPERIMENTAL WIRELESS TELEPHONE.
By Paul Shney.

If an amateur wishes to have the enjoyment of hearing voices come in over his aerial, he may do so at a very small expense if one of his neighbors uses an induction coil transmitting set with batteries. All that he will require is a good transmitter, such as the E. I. Co. No. 6080, and some additional battery power.

Nearly any transmitting circuit will work, but I found that the one given in the diagram worked best; being clear and loud for short distances. I also found that the results were better at the receiving end, without coil, condensers, or detectors.



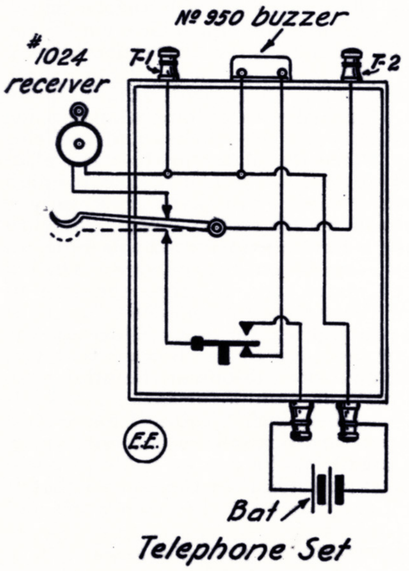
Sending Station



Receiving Station

Using two aerials about a block apart, the voice of the writer came in very distinct; if the A. C. house line switch was opened, to cut out the leakage and induction. However, the most remarkable results were obtained when the transmitter was strapped on to the reproducer of a phonograph, when the loudest results were obtained by connecting the iron mast of the sending aerial thru the receivers to a ground connection which was separate from the instrument ground. In fact the phonograph could be heard distinctly even when one man would stand on the board insulating the mast, but not touching the mast at all, while another man would stand near the ground wire, each holding a receiver tip in his hand. Since neither a spark gap or detector are used the results are not due to Hertzian waves, but must be due to electro-static induction between the two aerials in the first case; while in the latter case it is between the aerial and the mast. The mast either charging and discharging by means of the receiver and ground, or by the capacity effect of the bodies of the two men; since both were insulated from the aerial and ground, but each was parallel to one of the two. Using a short spark gap at the transmitting station and a detector and auxiliary apparatus at the receiving station, the results were very irregular, as only certain tones were heard.

SECOND PRIZE, $2.00.
HOW TO MAKE A SHORT LINE TELEPHONE.



Telephone Set

The following articles are needed only to make a two-party telephone that can be used up to a distance of 150 feet or more if E. I. Co. No. 1030 Pony telephone receivers are used instead of No. 1024. The battery used is for signalling purposes only, the receiver being used as a receiver and transmitter both.

One E. I. Co. telephone receiver No. 1024 or 1030.

One E. I. Co. watch case buzzer, No. 950.

Two E. I. Co. B 13 binding posts.

An E. I. Co. No. 4003 telephone cord may be used for each receiver and will improve the appearance of the set.

One double contact push button; this may be made from the E. I. Co. push by adding another spring.

The diagram shows the wiring of the receiver, buzzer, switch hook, and double contact push button and battery. The switch hook may be made from a piece of brass or copper rod.

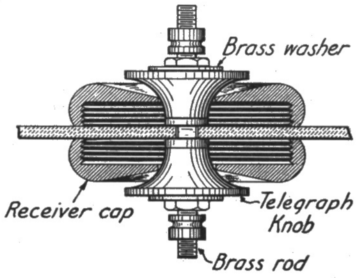
The spring on the switch hook should be strong enough to hold the arm against the upper contact springs when the receiver is off the hook, and when the receiver is on the hook its weight should be sufficient to hold the arm against the lower contact springs.

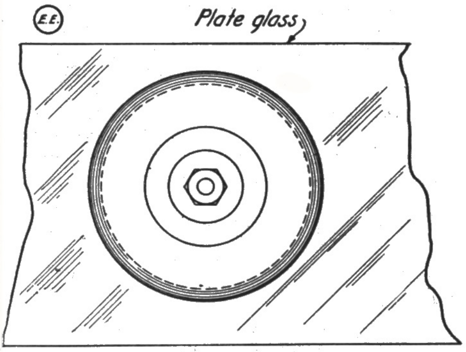
The normal position of the double contact push button should be against contact A which includes the buzzer in the circuit; when the button is pressed it introduces the local battery into the circuit which rings the buzzer at the other station.

No. 16 or 18 Annunciator wire may be used and two dry cells at each set.

Contributed by WILLIS GRATTEAU.

THIRD PRIZE, $1.00.
A NEAT LEAD-IN INSULATOR.





Two receiver caps are first procured and two telegraph knobs, which should be drilled through the center; the holes being large enough to pass 3/16 in. brass rod, which is threaded with No. 8-32 thread, the entire length.

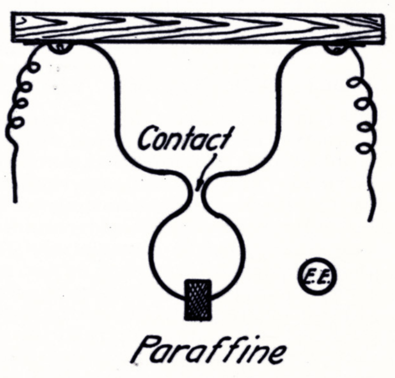
The lead-in is next assembled per the sketch, and should be run thru a hole a little larger than rod, in a piece of plate glass which is easily substituted for the windowpane already in the window.

Plate glass is more easily drilled than ordinary glass and will take more strain. It is easily drilled by means of a high speed electric drill and turpentine. Do not press on drill as drill is heavy enough.

I have had one like the following for over a year and have had no leakage or trouble of any kind. All these parts can easily be bought of the E. I. Co.

Contributed by H. CLIFFORD BULLARD.

AN AUTOMATIC FIRE ALARM.



Procure two pieces of spring brass, about 3½ inches long, and about ¼ inch wide. Shape them as shown in the drawing, and mount on a wood base. Between the lower jaws is placed a piece of paraffine, which when heated to a certain degree melts and allows the contacts to come together; closing the circuit; which may be arranged to ring a bell. It must always be mounted on the wall or ceiling so that the wax is below the contacts else the wax will insulate the contacts from one another when it melts. The jaws that hold the wax may be made saw-toothed so as to hold it better in case of a jar, etc.

Contributed by WILLIS GRATTEAU.

Wrinkles—Receipts—Formulas—Hints

By S. Gernsback.

Under this heading we will publish every month useful information in Mechanics, Electricity and Chemistry.
This department will be edited monthly by Mr. S. Gernsback.
We shall be pleased, of course, to have our readers send us any recipes, formulas, wrinkles, new ideas, etc., useful to the experimenter, which will be duly paid for, upon publication, if acceptable.

FORMULA NO. 2.

Colorings for Brass.

Fancy Colors.—Dissolve 4 ozs. of *Hyposulphite of Soda* in 1½ pts. of *Water,* then add a solution of 1 oz. of *acetate of lead* in 1 oz. of *water.* Place the article to be colored in the above mixture, and heat very slowly and gradually to the boiling point. The brass articles become successively red, deep blue, bluish white and finally white, with a tinge of pink.

Steel Blue.—Dissolve 3 drms. of *antimony sulphite,* 4 oz. of *calcined soda,* 1½ pt. of *water;* add 5½ drms. of *Kermes.* Filter and mix this solution with 5½ drms. of *Tartar,* 11 drms. of *Hyposulphite of Soda,* 1½ pt. of *water.* Polish your brass article, heat your mixture lightly and when warm, place it in it. The brass article will take a beautiful steel blue color.

Irridescent Brown Color.—Take the following, and dissolve: 4 oz. of *Hyposulphite of Soda,* 1½ pts. of *water.* Add to this a solution of 1 oz. of *Sulphate of copper* in 1 oz. of *water.* Heat gradually to the boiling point and place the object in the mixture. The brass article becomes first a fine rosy tint, then green, and finally irridescent brown.

Beautiful Greenish Color.—Dissolve 30 gr. of *Hydrochlorate of Ammonia,* 120 gr. of *Sulphate of Copper* in 1 qt. of *water.* Boil the solution and put the brass articles into it. The duration of the immersion is responsible for the intensity of the shades.

Patina.—To give brass articles an imitation of old bronze, with a beautiful green patina, use the following method: Dissolve 1 oz. of *copper* in 2 oz. of *Nitric acid,* add 15 oz. of *ordinary Vinegar,* and ½ oz. *Ammonium chloride.* The brass object is placed in this mixture for at least 4 or 5 days. Remove after this time, dry carefully and wipe with a rag and *linseed oil.*

Red Gold Coloring.—The red gold imitation used by the French workmen on brass articles is obtained as follows: Mix together 30 parts of *Alum,* 30 parts of *Nitrate of potassium,* 30 parts of *Red Ochre,* 8 parts of *Zinc,* 1 part of *Table salt,* 1 part of *Sulphate of iron.* This mixture is applied with a soft brush and the article is placed over a clear charcoal fire, until the salts are melted and dried, and the object assumes a brown aspect. It is then suddenly cooled in a weak solution of *nitric acid and water* containing 3 per cent. of *Hydrochloric acid.* Wash afterwards abundantly in water, and dry in sawdust.

Gilding Brass.—With the following method brass may be gilded so perfectly as to resist the corrosive action of strong acid:

Dissolve *Mercury* in *Nitric Acid* and dilute with *rain water.* Dip the article to be gilded in this solution and immerse afterwards in a weak solution of *Chloride of Gold.*

The philosophy of the action is as follows: The film of mercury, which is electro-positive to gold, dissolves in the chloride of gold solution, and a film of gold is electrolytically deposited in its place.

Dull Brass.—The German process to produce an artistic dull on brass is very easily obtained: Mix together 1 oz. of *Iron Oxide,* 1 oz. of *white arsenic,* 12 oz. of *Hydrochloric acid.* Apply with a brush after having cleaned the article thoroughly. Oil well, dry and lacquer.

Orange Gold Color on Brass.—Clean and polish the object and plunge it for less than a minute in a warm neutral solution of *Crystallized copper-acetate.* The brass should be heated previously to a degree just tolerable to the touch.

Bronzing Brass.—To bronze a brass article very quick and durably take a strong solution of *Nitrate of copper.* Boil the object in it. The shade to be attained varies with the length of boiling.

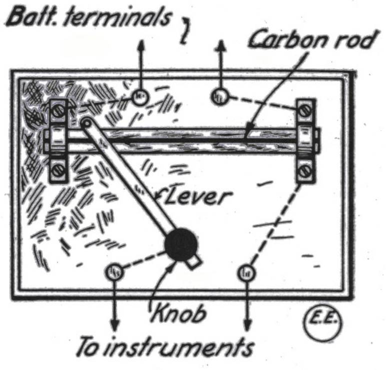
HOCH DER KAISER, VIA GOLDSCHMIDT SYSTEM.

President Wilson sent a wireless message to the German Emperor recently. It was sent from the Tuckerton, N. J., Goldschmidt Station to the station at Eilese, near Hanover, Germany, and Mr. Wilson received a reply from the Emperor by the same route, according to Emile Mayer, the American representative of the Goldschmidt Company in America. Mr. Mayer declined to give out the text of the messages, saying that they had been received for transmission by his company and that he had not been authorized to make them public.

Both messages went across the Atlantic Ocean, Mr. Mayer said, without a hitch or relay of any kind. That from President Wilson was sent early in the morning, and the Kaiser's reply was received at 10 o'clock at night and immediately put on the wire for Washington. The distance traveled by each wireless message, Mr. Mayer said, was 4,062½ miles.

The station is the largest and highest powered in the United States, according to the builders.

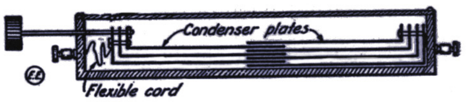
A NON-INDUCTIVE POTENTIOMETER.



An easily made Potentiometer that has advantages over the fine wire type may be made as follows: Take an ordinary hard lead pencil and after soaking it in hot water; carefully split it in half, so as to expose the lead. Fasten this to a base by means of two strips of brass at each end, which will also serve as contacts to the lead. A piece of strip brass is pivoted at one end so as to make a sliding contact over the lead, and a small handle is fastened to the other end of this strip. Connections are shown in attached drawing, also an E. I. Co. carbon potentiometer rod at 50 cents may be used in this way.

Contributed by CLIFFORD G. BURR.

HOW TO MAKE A VARIABLE CONDENSER.



The strength of incoming signals can often be greatly increased by the use of a variable condenser. If inserted in the ground wire a wave length of less than the natural period value of the aerial may be received; and if placed from end to end of the tuner or loose coupler primary a longer wave length may be received. It is therefore a very desirable piece of apparatus for the amateur, especially as it can be made quite easily.

Procure some light copper or aluminum (procurable from the E. I. Co.), the lighter the better. Make sure that it is perfectly flat, as any unevenness in the surface will greatly decrease the efficiency of the condenser. The quantity required depends, of course, on the size of condenser desired.

A convenient size for each plate is 4x5, and the number of plates 7. For a condenser of this size, cut the brass or copper into sheets 4x6. Then get some heavy wrapping paper and shellac it on very carefully. Be sure that the ends and edges are well insulated with the paper, or otherwise the plates will short circuit. Shellac will serve better than glue, as it is not a conductor, and will help to make the insulation better. Then bend up at right angles one inch of each plate, making it 4x5. Scrape off on this edge about ½ inch square of the paper, being sure that it is well above the place where the ends of the plates will meet, at the center of the overlapping edge.

Then make a wood base for the instrument, 5x12. Out of a strip of wood 1¼ inch wide make an oblong whose inside dimensions will be 4 1/16 inches by 9¾ inches and nail this to the centre of the base. Place the plates in this box, placing the overlapping edges alternately. Drill a hole through the set which has the greater number of plates, in this case 4, where the paper has been scraped off. Drill right thru the end of the box. Place a binding post thru this hole, so that the connection can be made on the outside. Drill a hole thru the other set of plates, but not thru the side of the box. Put a nut thru the hole and connect a piece of braided wire to it when you tighten the nut. Close up the condenser. Drill a hole in the edge of the box so that you can fit a binding post to it, opposite the one at the other end. Join the braided wire to it. The handle for making the adjustment can be made in various ways. A dowel pin with a handle at the end can be put thru one end of the box, and a lid placed on it, or else a metal handle can be made to come up thru the top and a slit sawed out thru the top so that it can be slid in and out. Lastly smooth the woodwork and varnish it.

Contributed by EDGAR FELIX.

Archie S. Waterbury of Perry, N. Y., writes us as follows: "Order No. 105,440 at hand and O. K. You can send to me for recommendations on your lightning switch, it's a peach."

LATEST PATENTS

IMPROVED ELECTROLYTIC RECTIFIER.

Alfred Heinz, of Paris, France, has been awarded U. S. Patent No. 1,097,801, on an improved form of electrolytic rectifier or *condenser* as the patent states. The improvement consists of making up the rectifier unit of two dissimilar electrodes as seen at fig. 2, mounted on an insulating cover, and immersed in a solution, such as generally employed; but instead of forming the anode of sheet lead, or iron, etc., this electrode is composed of a grid shaped cylinder as shown in the sketch.

In order that an apparatus so composed may operate in a continuous manner, it is necessary for the electrolyte to constantly circulate around the electrodes; if not, polarization and clogging ensue and interrupt the operation.

The arrangement forming the subject of this invention has for its object to insure a constant displacement of the whole mass of liquid from the surface of the electrodes and not a simple up and down movement of such liquid. For this purpose, the converter of the present system is composed essentially of a receptacle containing the electrolyte, in which is immersed a circular electrode of lead alloyed with antimony, which is itself composed of a multitude of small open cells, of special form, distributed over the entire surface of the electrode; in the central space of this electrode is arranged a cylinder of aluminum constituting the second pole of the couple. It will be understood, that on a current passing thru the system, a gaseous disengagement will occur on the surface of the lead electrode, which will produce an immediate displacement of the electrolyte thru the cells, so that the liquid surrounding the aluminum will be caused to be displaced and constantly renewed over the entire surface, and that in a direction perpendicular to the diameter. No polarization can therefore occur and the converter will operate in a continuous manner. The temperature of the electrolyte will moreover be uniform throughout the mass, owing to the ready diffusion thru the cells.

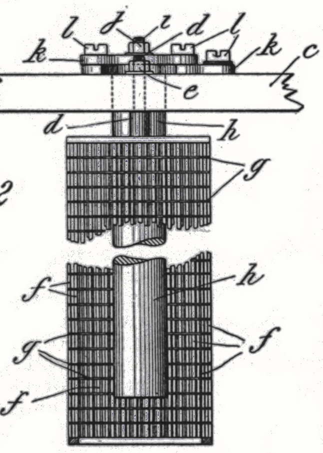


Fig. 2

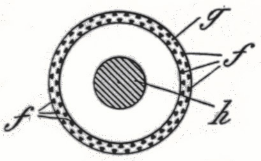


Fig. 3

The accompanying drawing illustrates the detail of a converter constructed according to this invention. This appears to be marked improvement over the ordinary rectifier cell using metal plates.

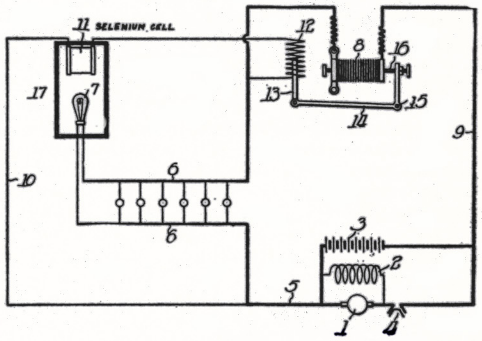
Fig. 2 is an elevation of the two concentric electrodes, the outer annular electrode being partly broken away in order to show the central electrode more clearly; Fig. 3 is a horizontal section of these two electrodes.

SELENIUM-CELL LAMP REGULATOR.

In a patent granted to Morris Moskowitz, a new use is made of the well-known principles and characteristics of selenium cells. He uses it to effect the automatic regulation of the voltage applied to an incandescent or other lamp by virtue of the intensity or brilliancy of the lamp itself.

Referring to the drawings, there is illustrated diagrammatically, a suitable generator 1, having a shunt field 2, connected in circuit with a storage battery 3. A switch 4 which may be of any suitable type, such for example as the automatic switch used in connection with many car lighting systems, is adapted to close the circuit from the generator to the battery, and the external circuit. The circuit is supplied by the storage battery under normal conditions.

When the generator is running at the proper speed to develop a voltage in excess of that of the battery, the generator will charge the battery and also carry the lamp load. In order to overcome the counter E. M. F. of the battery, a voltage somewhat higher than the battery voltage is required of the generator, and in order that this excess voltage may not be impressed upon the lamp circuit, it is necessary to provide suitable means such as a resistance to control said circuit within the proper limits.



In the system illustrated, the circuit from the battery and generator is through conductor 5, lamp circuit 6, 6, regulating lamp 7, variable resistance 8, conductor 9, and thence back to the battery and generator. The regulating circuit is connected around the lamp circuit and may be traced from conductor 10, through selenium cell 11 and solenoid 12, back to the main circuit. A plurality of cells may be used if desired. The resistance 8 may be of any suitable type, the one illustrated consisting of a series of carbon blocks under pressure and adapted to vary their resistance in accordance with fluctuations in pressure applied to the ends of the series. The solenoid 12 is provided with a plunger 13, which rocks the bell crank lever 14 about its pivot 15, thereby causing the adjustable screw 16 to provide a varying pressure for the carbon blocks. It is obvious that any other suitable resistance mechanism may be employed, the one described being for the purpose of illustration only.

The operation of the system is as follows: When the lighting system is at its minimum or normal voltage, for example 30 volts, the regulating lever 14 will lower of its own weight, thereby compressing the carbon disks 8 so as to reduce to a minimum the resistance in the lamp circuit. When however, the generator speeds up and closes the automatic switch 4 to charge the battery and feed the lamps at the same time, the slight increased voltage on the lamp circuit will increase the candle power of the regulating lamp 7, the light from which lamp, impinging on selenium cell 11, will decrease its resistance, whereby more current will flow through the solenoid 12, causing the coil 13 to be drawn up, thus releasing some of the pressure on the carbon disks 8 and introducing an increased resistance into the lamp circuit, thus checking the tendency of the voltage to rise abnormally. It will be apparent that upon a slight drop in the lamp voltage, a reversal of the above operation will take place, the increased resistance of the selenium cell reducing the current in the solenoid 12, thereby decreasing the resistance of the carbon disks 8. It will be further apparent that the operation will be substantially the same where a plurality of selenium cells are used. It should be noted that the regulating lamp 7 is connected directly across the lamp circuit 6, so that it responds to all fluctuations in the lamp circuit.

"AEROPLANE WIRELESS."

A Frenchman by the name of Rouzet has recently been granted patent No. 1,106,727 on an aeroplane wireless set, which is shown in our sketches herewith, viz., figs. 1 and 2. The arrangement of the parts on the flying machine to protect the aviator against shocks from the transmitting set is quite ingenious and is covered in detail in the inventor's description as follows:

In fitting up a wireless telegraphy station upon an aeroplane it is of great importance that in operation there shall be absolute protection from the possibility of the aviators receiving a fatal or other electric shock. The pilot in particular must not be exposed to the fear of accident through coming into contact with the installation. In fitting up a station on the aeroplane with floating antenna, that is a wire hanging beneath the aeroplane, all the fixed parts of the installation can be perfectly insulated. The winch, however, for rolling up and unrolling the antenna presents greater difficulty in the matter of perfect insulation, and it must be borne in mind that the winch is the part of the apparatus which has to be most often manipulated.

The present invention relates to a general arrangement of the installation, by which a tension node is obtained at the starting point of the antenna, that is to say at the winch upon which it is rolled. In this way the insulating of this portion becomes very simple and the dangers of sparks or electrification thru contact with this part are practically eliminated.

Fig. 1.

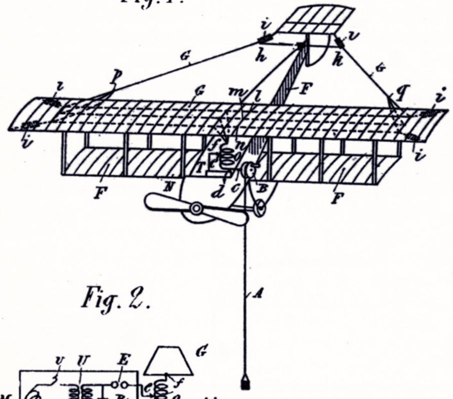


Fig. 2.

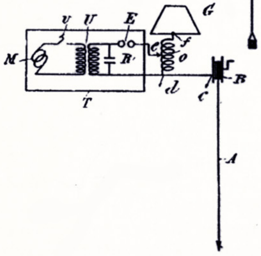


Figure 1 of the accompanying drawing shows an example of this arrangement and Fig. 2 is a diagram of the same arrangement.

Fig. 1 shows an aeroplane F which is provided with a wireless installation constructed according to the present invention.

A is the flying antenna, which is rolled up and unrolled by means of the winch B on the framework N of the aeroplane, *i. e.* within reach of the aviator operating the device. This winch is connected by a very short connecting device *c—d*, to the coupling device *o* the other extremity *f* of which is connected with one or more wires G stretched upon the aeroplane and forming a small metallic network, which is so proportioned as to equilibrate the antenna with respect to the electric oscillations and therefore constitutes a "counterpoise." The metallic network forming this counterpoise is very carefully insulated at all points of attachment *i* so as to avoid any contact or production of sparks from the wires G of such network. The insulation at the points of attachment *i* may be effected in any suitable manner, for instance by means of ebonite rods of sufficient length to insure such insulation. Each of the rods is attached at one extremity to the framework of the aeroplane while the wires G are attached at the other extremities of the rods. The wires of the counterpoise may be constituted by a single wire, by two or more wires in parallel or by cables as follows from general considerations in connection with the construction of antennæ for wireless telegraphic apparatus.

The invention is further characterized by the following arrangement:—The apparatus for producing the oscillations, T, is connected to a coupling device *o* in such a way as to excite or energize the "counterpoise" G. The transmitting apparatus T, can be of any system whatever for producing high-frequency; it can for example comprise an alternator M driven by the aeroplane motor, a key *v*, a transformer U, a condenser R and a spark-gap E. A transmitting device comprising the aforesaid elements is shown schematically in Fig. 2. For the sake of clearness the details of the transmitter T are not shown in Fig. 1 in which only the connections of said transmitter T to the points *d* and *e* of the coupling device O are indicated. The antenna A is connected to the lower part of the coupling device at the point *d* that is to say at the point where with ordinary fixed installations the earth is connected. The supplementary convolutions of the device *o* (that is those between *e—f*) are so chosen as, with the counterpoise G to equilibrate the wire connected at *d* so that there is a tension node at the point *d*. The wires of the counterpoise are characterized by an arrangement so that the induction in the parts of the aeroplane is a minimum. With this object in view they may be arranged in various ways according to the length of the antenna. For instance, for a short antenna, the arrangement is such as shown at Fig. 1; one or more wires *f—p—h* and *f—q—k* with or without a connecting wire *h—k*. For a long antenna, the counterpoise with the connecting wire *h—k* may be in sections *l*, *m* and *n*, these points being then insulated as at *i*. In these cases the length of the wire is greater than and in electrical discord with the length of the stretchers of the metallic portions of the aeroplane.

Albert Curtis, of Los Angeles, Cal., says of the "Electro" apparatus:

"I am now using your 'Interstate' Receiving Set for short distance radio work, and find it to *work as advertised, if not better.*"

A PERPETUAL ELECTRIC CURRENT.

It is true of some discoveries—not of all—that after they are brought to light they seem almost self-evident. What must happen if an electric current is started, say by induction, in a closed circuit having a vanishingly small resistance, says the "Scientific American." The energy is not dissipated as heat, since the heat produced is proportional to the resistance, in this case zero. There is no other obvious way in which energy would be dissipated, and the only conclusion left open to us seems to be that the current would continue indefinitely.

That this hypothetical case should actually have been realized must be a surprise even to anyone who may, at some time or other, have gone through the argument given above. Yet this is what has happened. Prof. Kammerlingh Onnes, the Dutch physicist, famous for his researches on low temperatures, has shown that several metals, when cooled to a definite temperature, low, but still above the absolute zero, cease to have any measurable resistance, and that a current started in a lead coil by induction continues indefinitely so long as the coil is kept cooled with boiling helium. Such a coil behaves like a permanent magnet, deflecting a magnet needle brought into its neighborhood. If the coil is connected up to a galvanometer there is an instantaneous deflection, and the current dies out in the circuit, which now includes a resistance.

In Prof. Kammerlingh Onnes's experiment a lead coil was used which at room temperature had a resistance of 736 ohms. In liquid helium the resistance fell to less than a twenty-billionth of this, and the current was over one-half ampere. At 6 degrees absolute there is a somewhat abrupt fall in the resistance of the lead, to practically zero. For each of several metals tested there is such a point. In the case of mercury it is 4.2 degrees, for tin it is 3.8 degrees absolute.

It had been the hope of physicists that very low temperatures would furnish us a means of producing very powerful magnetic fields, by the use of conductors cooled to very low resistance, and carrying large currents. But in this they have met with some disappointment. It has been found that when the cooled conductor is placed in a strong magnetic field, its resistance once more rises to a finite value.

Prof. Kammerlingh Onnes's discovery is, at any rate from the point of view of pure science, one of the most remarkable events in the progress of science during an epoch abounding with important developments. Whether it will have any direct practical application it is impossible to foresee at present, but indirectly, thru the increase in our understanding of matter and electricity which is bound to follow from this discovery, there can be no doubt that many important material advantages will be gained.

A MICROSCOPIC MOTOR.

Mr. I. T. Nedland, a jeweler of Hillsboro, N. D., recently exhibited at the University of North Dakota, Grand Forks, a working electric motor weighing 34 grains, the construction of which occupied his spare time for a month. The dimensions of the motor are as follows: Length, 0.563 in.; height, 0.291 in.; width, 0.336 in.; diameter of armature, 0.071 in.; diameter of commutator, 0.0106 in. The armature, which weighs 4 grains, has six slots and six commutator segments. A 2.5 volt battery supplies the energy for operating this tiny power unit.

CONCERNING "REAL" CAT-WHISKER DETECTORS.

One of the E. I. Co. customers recently purchased one of their new "Mignon" Receiving Sets at their retail store, New York City, and a few days afterward brought it back to the clerk, with the complaint that it would not work. The set was carefully tested and nothing found the matter with it. The clerk then started to investigate and his first query to the customer brought forth the following extremely startling reply:

"He stated that he could not get the 'Mignon' set to work in any fashion whatever, when used with a pair of 2,000 ohm phones and a *Cat-Whisker Detector of the genuine type,* which he had went to great trouble in making up from a piece of Galena and a *real Cat-Whisker!*"

Edwin Hooper of Fargo, N. Dak., writes the Electro people:

"I am a constant user of your goods and want to congratulate you for putting out such apparatus at such a remarkable low price. My receiving set consists of your loose coupler, both fixed condensers, tuner, variable condenser, Transatlantic 'phones, and aerial switch. I consider this one of the best obtainable sets for amateur use. With this set I have been able to receive about 2,000 miles."

AMONG THE AMATEURS

AMATEUR RADIO STATION CONTEST.

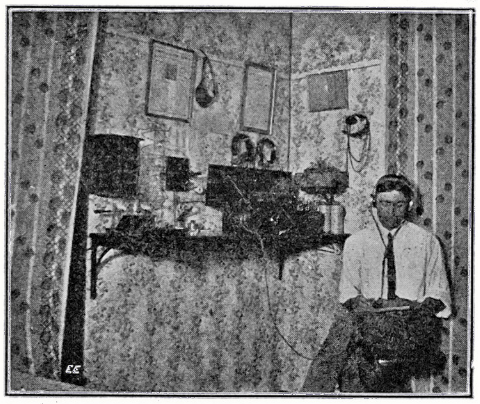
Monthly Prize, $3.00.

This month's prize winner.

RADIO LABORATORY OF DELBERT MYERS.

Herewith is a flashlight photo of my Wireless Station, which is the result of several years work along this line.

My aerial is composed of six No. 9 copper wires each 100 ft. long and spaced 2 ft. apart, elevated 70 above the ground. The transmitting set consists of a one inch spark coil, glass plate variable condenser, small condenser across vibrator to reduce sparking, zinc spark-gap and helix coil. Tubular variable condenser, Fixed condenser, circular potentiometer, two 2 point switch, silicon and **Radioson** Detectors, and two pairs of E. I. Co. 2,000 ohm receivers make up the receiving set, mounted in a cabinet 8 in. x 10½ in. x 24 in. The connections are all made with stranded wire and are as short as possible. The cabinet is finished in dark oak, and has a handsome appearance. The ground is made up of six cables, seven strands each, of No. 12 iron wire, buried 6 ft. deep.

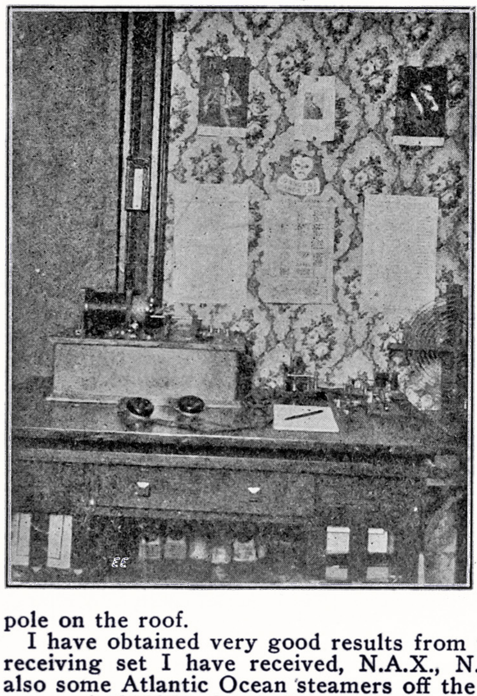


With this outfit I am able to hear most of the high power radio stations. I am able to pick up the Arlington time-signals twice a day. I have a general receiving range of 2,000 to 3,000 miles.

DELBERT MYERS, Amboy, Ind.

COHEN RADIO STATION.

I am herewith giving you photograph and description of my wireless station, which is the outcome of six years of somewhat costly experimentation.



My transmitting set consists of two inch spark coil, plate glass condenser, oscillation transformer, key and a 6 volt, 80 A. H. storage battery for supplying the current.

The receiving set consists of a loose coupler, perikon and silicon detectors controlled by a two point switch; two rotary variable condensers, fixed condenser, a buzzer test and a pair of two thousand ohm 'phones.

My aerial consists of 6 horizontal copper wires supported by a sixteen foot pole on the roof.

I have obtained very good results from my set. With my receiving set I have received, N.A.X., N.H.R., N.A.A. and also some Atlantic Ocean steamers off the coast.

SAMUEL COHEN, 242 Hinsdale St., Bklyn., N. Y.

Robert L. Richards, of Buffalo, N. Y., informs the E. I. Co. in a recent letter:

"I am an electrical experimenter and your goods have been recommended to me as being very good by friends of mine residing in Oil City, Pa."

THE LIEBEN-REISZ GAS RELAY VS. THE AUDION.

In a recent letter to the editor of "The Electrician," London, the merits of the Lieben-Reisz Detector were discussed, as follows:

Sir: I should like to make the following remarks on the letter of Dr. Lee de Forest which appeared on p. 956 of your issue of March 13, 1914.

Dr. de Forest presumes that the relay constructed by Mr. van Lieben and myself is identical with the Audion described in the American patents Nos. 841,387 and 879,532, and only differs from this apparatus in its ratio of amplification and its current and pressure consumption. This supposition of Dr. de Forest's is based on a fundamental error regarding the operation of his apparatus in comparison with ours. The so-called Audion depends upon the influence of the cathode rays on the current amplified while in the Lieben relay, in its present form, glow discharges are employed by which the circuit receives ionised gases or vapor. From this principal difference alone proceed fundamental differences in the operation and ratio of amplification. It is, therefore, important here to note that the cathode ray relay is by no means Dr. de Forest's original invention. Mr. Robert von Lieben, in his German patent 179,807, of March 3, 1906, describes for the first time the cathode ray relay, so that the priority for using this arrangement for amplifying the current belongs to Mr. Robert von Lieben. German patent 179,807 belongs to the same syndicate which owns other patents by Mr. von Lieben and myself. The principle of the pure cathode ray relay was given up by us later, because we found that by the use of the glow discharge which occurred in ionised gases considerably better working could be obtained. The combination of a Wehnelt cathode with network auxiliary electrodes in the space between the cathode and anode, and the standardization and increase of the relay operation by the introduction of mercury vapor into this relay, was demonstrated by us for the first time, a fact which Dr. de Forest cannot contradict. The American patent 837,901, quoted by Dr. de Forest, in which the Audion filled with mercury vapor is mentioned, need not be considered in this case, because the influence of mercury vapor on the life and operation of the relay is only influential when the Wehnelt cathode is employed.

The problem of increasing as desired the current oscillations was first solved by the use of a Lieben tube, because it is thus possible, by the use of a greater discharge current, to obtain results which are likely to be of great importance in loud-speaking telephony. The amplification ratio of 20,000 obtained by connecting several relays in cascade, has been repeatedly demonstrated by myself and noticed by others, so that the doubts of Dr. de Forest regarding my results in this direction are without foundation. In the particular principle described in our latest patents it is possible, where only a small primary energy operates on the relay, considerably to reduce the dimensions of the discharge space and heating voltage, while measurements have shown that our relay also gives under these conditions an amplification ratio which exceeds many times that given by the Audion.—I am, etc.,

EUGEN REISZ.

Berlin-Treptow, June 15, 1914.

NOON TIME VIA WIRELESS.

The erection of a wireless telegraph apparatus on the top of the main office of the Bethlehem Steel Company is completed and hereafter when the noon whistle is blown watches and clocks may be set at 12 o'clock sharp because the time will be flashed from the radio station in Virginia near Washington, D. C. The sending apparatus has a range of 3,500 miles and probably in a short time it will be used for the transmission of important communications.

The King of England received William Marconi at Buckingham palace recently and conferred upon him the honorary knighthood of the Grand Cross of the Royal Victorian Order.

WIRELESS STATION CONTEST

Our **Wireless Station Contest** is open to all readers, and a monthly prize of $3.00 is offered for the best description and photo of a wireless or electrical laboratory. Be brief and send us dark toned prints in preference to light toned ones. Write your description on separate sheet of paper. Typewritten copy preferred.

QUESTION BOX

This department is for the sole benefit of the electrical experimenter. Questions will be answered here for the benefit of all, but only matter of sufficient interest will be published. Rules under which questions will be answered:

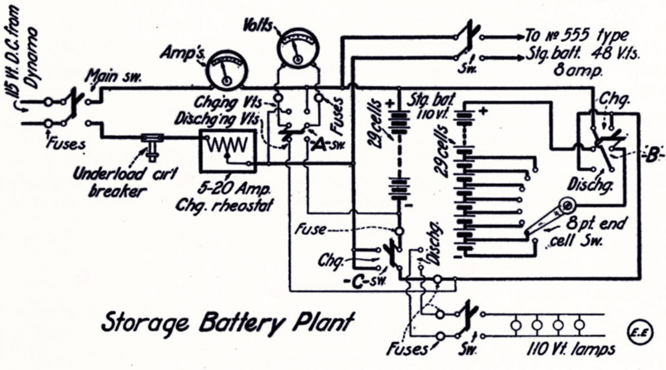
1. **At least one of the questions must deal with "E. I. Co." apparatus or instruments, or "E. I. Co." merchandise.**
2. **Only three questions can be submitted to be answered.**
3. **Only one side of sheet to be written on; matter must be typewritten or else written in ink, no penciled matter considered.**
4. **Sketches, diagrams, etc., must be on separate sheets. Questions addressed to this Department cannot be answered by mail.**

LARGE STORAGE BATTERY PLANT.

(173.) C. E. M., Tarrytown, N. Y., desires full quotations on a special "Electro" storage battery plant for lighting a few 15 Watt, 110 volt, Tungsten Lamps several hours each day; and also on a set of batteries for lighting a private house.

A. 1. Per the advices of the E. I. Co. engineers, and per the statements of your engineer, relative to a storage battery installation for your school and also for a private dwelling as we understand from him, they take pleasure in quoting you prices as follows, on complete equipment suitable for this plant; including the charging of the cells with switchboard auxiliary apparatus, etc.

The first and principal storage battery outfit composed of 58 type R. E. 20 A. H. storage cells of "Electro" manufacture, for 110 volt service, for the purpose of lighting a few 15 Watt, 110 volt Tungsten lamps during a period of 5 to 6 hours each day, and to be recharged each day or in the evening is outlined below.



Complete Layout of Charging Circuits

Storage Battery Outfit No. 1.

110 volt set of 58 type R. E. 20 A. H. cells No. 1215.

58 No. 1251 type R. E. 20 A. H. 2 volt storage cells @ $1. 70 each	$98.60
1 No. 518 Electrolyte Hydrometer	.30
1 8 point End cell Switch	4.00
1 Type C. H. E. I. Under-load, Single Pole, Circuit Breaker	14.00
110 volt type 0-50 amps. capacity (standard unmounted switchboard type) adjustable.	
1 Battery Charging Rheostat, good for 20-28 cells; or 50-70 volts charging voltage, 5-20 amps. capacity	35.00
1 Type E. V. Switch Board style Jewel bearing voltmeter 0-150 volt scale 7⅛" diameter case	15.50
1 Type E. V. Switch Board style Jewel Bearing Ammeter 0-25 amp. scale 7⅛" diameter case	14.00
(Both meters of back connection type for mounting on switchboard.)	

Switches.

2 Fuse Blocks with fuses, @ $.60	1.20
3 D. P. D. T. unmounted knife switches 25 amps. rating @ $1.26	3.78
2 D. P. S. T. unmounted knife switches 25 amps. rating @ $.68	1.36
Total	$187.74

For the private dwelling mentioned by your engineer and as we understand from him, they take pleasure in suggesting a 24 volt low potential storage battery set, composed of four No. 555 6 volt 60 A. H. storage batteries which are to be connected in series giving 24 volts for the set. This 24 volt battery set to be furnished in *triplicate* so that two 24 volt sets can be charged during a period of two or three days and thus a reserve battery could always be on hand for emergency; and the battery to last from 3 to 5 days and possibly more, if but a few lamps are used each evening in the private dwelling.

The storage battery outfit No. 2 for the private house lighting may be outlined as below:

Storage Battery Outfit No. 2.

For Private House Lighting.

24 volt sets, comprising 4 No. 555 type batteries rated at 6 volts 60 A. H. each, normal charging and discharging rate 7½ amps. for 8 hours approx. and comprising	
3 sets of (4 No. 555 6 volt 60 A. H. storage batteries @ $8.00 each), or total of 12 batteries	$96.00
Less 10%	9.60
Total	$86.40

Regarding the details of this storage battery installation they beg to advise briefly regarding it as follows:

They understand that you are to furnish the switchboard of slate or marble and that the various switches and indicating instruments as well as the circuit breaker, etc., are to be mounted on same by your engineer. Prices outlined above include all of this auxiliary charging apparatus, and the arrangement of the various parts of the circuit, etc., are given on the appended diagram.

As will be observed an 8 point end-cell switch is provided in series with one set of batteries, which, by the way are charged on series-parallel at about 60 to 70 volts, and discharged in series at 110 to 115 volts by simply reversing a D. P. D. T. Knife Switch as shown at "B." The function of this end-cell switch, which always has its blade left on the highest point, that is No. 8 when recharging the battery; is to enable the battery discharge voltage to be regulated to approximately 110 volts for the lamp circuit, etc., as if this is not provided for in the way outlined herewith; you will get too high a voltage from the 58 storage cells when they are freshly charged, as they then give about 2.2 volts each approximately, which means of course a gross voltage for the battery with all cells in series of 127.5 volts. As the Tungsten lamps used on same should not have much over 110 volts applied to them (and of course there is a few volts drop in the circuit leading from the battery to the lamps), it becomes practically necessary to arrange for the adjustment of the battery discharge potential, which is accomplished in the manner here described, utilizing an 8 point end-cell switch, as it is termed.

It is usual in storage battery practice to never discharge the cells much below 1.8 volts each when they should be recharged. This, of course, gives a voltage of 104.5 at the point of full discharge approximately, and in between the points of full recharge with a gross voltage of 127.5; and the full discharge with a potential of 104.5; the voltage can be regulated nicely by the end-cell switch, which cuts in or out of circuit, more or less cells as required.

In regard to the charging of the 3 No. 555 type house batteries, which, of course, comprise each 4 No. 555 type batteries, it is best to charge two of these sets composed of eight batteries in series, giving 48 volts roughly, as the charging potential which is indicated on our diagram and the maximum charging rate at this point will be from 8 to 10 amp. or more nearly correctly, about 7½ amperes for eight hours; and the discharge rate for lead cells, such as these are composed of, is usually 8 hours, and the ampere hours rating of any battery divided by the number of hours, gives the ampere discharge rate, and vice versa.

The voltage applied in the charging circuit is given by the voltmeter connected to the D. P. D. T. Knife Switch as shown and also the amperes in the main charging circuit is given by the ammeter connected in series with the charging circuit as shown.

The under-load automatic circuit breaker which they propose furnishing will protect the dynamo from reverse current from the battery and this breaker or automatic cut-out is of the manual reset type and does not close itself automatically; and which function is moreover practically never used in modern storage battery practise.

When the battery is not being charged the voltage of same can be ascertained by throwing the D. P. D. T. switch "A" in the discharge position, as indicated in diagram. It is evident from our sketch also that when the D. P. D. T. series-parallel battery switch "B" is thrown in the discharge position, that the D. P. D. T. service switch "C" must not be thrown into the charging position, as per our sketch, as this would constitute a short circuit and damage the battery, which of course, can be protected by fuses as indicated. The arrangement of apparatus here presented is such that either the house battery, or the 58 cell type R. E. battery, can be charged independently of each other if desired; or simultaneously, as long as the charging current does not go above 20 amperes gross value, which is the capacity of the large adjustable Rheostat here specified.

They trust that this arrangement and also the prices of the apparatus and goods outlined, will meet with your approbation and in closing wish to also state that delivery on these goods will require about 10 to 15 working days after receipt of your order. All necessary information and diagrams, etc., will be furnished gratis.

RADIO TUNING QUERY.

(174.) G. C. Southworth, Grove City, Pa., states he finds it difficult to tune in any nearby amateur radio station, altho he can receive the Arlington time signals, etc.

A. 1. Replying to your communication, we desire to say that we have received several letters from people in your vicinity who have experienced the same apparent freak radio conditions that you mention. We believe that possibly part of this apparent tuning trouble is due to the fact that a variable condenser is not used in series with the ground when trying to tune in short wave lengths, such as used by nearby amateurs, and of course this is necessary as the large aerials usually have a natural period wave length too high to enable you to tune in short wave lengths efficiently, if at all.

We might suggest that you employ a directional aerial; preferably of the sub-divided umbrella type, so that any section of the umbrella may be switched in by means of a proper switch, for receiving the signals from a certain direction, etc., keeping the length of the aerials reasonably short.

RADIO QUERIES.

(175.) Archie Fenner of Merna, Neb., asks several questions regarding radio matters, storage batteries, etc.

A. 1. For data on fixing up storage battery plates, etc., we take pleasure in recommending our 25 cent manual on "Small Accumulators and How to Build Them," by Marshall. If you desire a D. C. Generator rated at 110 volts capable of supplying 1 K. W. or about 9 to 10 amperes at 110 volts, the E. I. Co. price will be $70.00 net, f. o. b. New York, net. This machine will be suitable for the purposes you mention including the exciting of an E. I. Co. type S. O. 200 transmitting set, etc.

The range of the "Transcontinental" receiving set made by the E. I. Co. which you are interested in, is as stated in their catalogue No. 14; and where the aerial is not very large the range of course is reduced correspondingly. However, an aerial with a fair altitude of say 100 feet, and a flat-top length of 200 feet, should give very good results indeed in the open country, and where the altitude cannot be made so great it may be compensated for by using more strands in the aerial and using a greater length in the flat-top. A heavy Antenium copper wire will be good for the lead-in. Also, a cable composed of about 6 No. 14 Antenium conductors, stranded together, constitutes a very fine lead-in terminal.

GERNSBACK ELECTROLYTIC INTERRUPTERS.

(176.) S. Seeberger, Oakland, Cal., inquires about the operations of the Gernsback Interrupter with which he has had considerable trouble.

A. 1. In regard to the Gernsback Electrolytic Interrupter would say that of course the metal rod within the tube should not project thru same, and of course it should never under any conditions make contact with the lead electrode; and we wish to state that the lead electrode may be bent so that it is as much as 1 inch or more away from the opening in the porcelain tube; as this merely acts to conduct the current into the solution.

In the January 1914, *Electrical Experimenter,* you will find a special article which will undoubtedly clear up your difficulties in a satisfactory manner. Many thousand of these Interrupters are used thruout the United States and abroad for experimental, wireless and X-Ray operations, with entire success.

In regard to the noise you speak of in reference to this interrupter, would say that when normally operated and properly connected in circuit, we have never noticed any such extreme noise caused by the operation of same and believe this may be due to the fact that you have polarity on same reversed; or that the tube does not fit tightly in the cover. An adjustable choke coil connected in series with the primary interrupter circuit, as explained in the *Electrical Experimenter* aforementioned helps matters wonderfully, and 5 parts water to 1 part sulphuric acid should be used as the solution, mixed by volume, giving about 1250° specific gravity.

RADIO WAVE ABSORPTION.

(177.) Elvin L. Hartlett, Wansan, Wis., writes us in regard to a theory he has relative to radio wave absorption by the ultra-violet rays of the sun's light, etc.

A. 1. In reply to this query relative also to an article which appeared in a recent number of the *Electrical Experimenter,* on "The Effect of Sunlight on Radio Waves," would say that your discussion is of interest and as near as the matter is known at this time the sunlight effect and also it is believed moonlight effect as well, on the ether, is to highly ionize it; and this is supposed to cause the ether to offer a high resistance to the passage of free electric waves in space and in general this is called the "absorption factor."

Altho we are not certain as to just what you mean in your communication and discussion, we are inclined to infer that you believe that the sun's rays actually absorb some of the ether, but this seems hardly possible in accordance with the well known rules of physics, that matter can neither be created or destroyed, but always remains present in some form or other; such as, for instance, when water is boiled and steam is generated, the water remains; but, of course, in the form of water vapor, et cetera.

The Marconi Trans-Atlantic Wireless station at New Brunswick, N. J., has been completed and messages have been sent to the station in Wales, England.

WIRELESS AND ELECTRICAL BOOKS.

We have on hand the following books of interest to every electrical and wireless man, and any other books on these subjects you are interested in, will be quoted upon request.

Uses of Electricity on Shipboard, (Kellogg)	$1.00
A. B. C. of the Motorcycle	1.00
Wireless Telegraphy, (Sewell)	2.00
Radium, (S. R. Bottone)	.50
Electrical Apparatus	1.00
A. B. C. of the Telephone, (Homans)	1.00
A. B. C. of Electrical Experiments, (Clarke)	1.00
Electric Bells and All About Them, (Bottone)	1.00
A. B. C. of Electricity	1.00
Induction Coils, (Trevert)	1.00
Radiography, (Bottone)	.50
Electric Light for Country Houses, by Knight	.50
A. B. C. of Wireless Telegraphy, (Trevert)	1.00
Wireless Telephone, (Cloth Bound), by H. Gernsback	.50
How to Become a Successful Electrician	1.00
Model Flying Machines	.50
Books of Plans and Building Construction	.50
Aeroplane Portfolio	.50
Electric Wave Telegraphy, by Dr. J. A. Fleming	7.50
Electrical Dictionary, Pocket Edition, Full Leather, Thumb Indexed	.50

VALUABLE 25c. ELECTRICAL HAND-BOOKS.

Size 5 ins. x 7 ins. Sent Postpaid.

WIRELESS

100 **How to Make Wireless Instruments.** The best experimental book ever published. Can't be matched for $3.00. Written by Twenty Wireless Experts. Tells how to make 25 different pieces of apparatus. 76 illustrations. 96 pages.
101 **The Wireless Telephone.** By H. Gernsback. The first wireless telephone book for the experimenter and amateur. Chock full of valuable information. Tells how to make battery wireless telephone outfits, to work over several miles at low cost. 60 illustrations. 64 pages.
102 **Construction of Induction Coils and Transformers.** Compiled and arranged by H. W. Secor. It has different chapters on the construction and design of Induction Coils from ⅛ inch to 12 inch spark. Also chapters on High Tension Transformers, Tesla Coils, Transformers, High Tension Condensers, Iron Core dimensions, Sparking distances, Wire values. 72 illustrations. 100 pages.
103 **Wireless Hook-Ups.** The best book on wireless connecting diagrams in existence. 182 different illustrations for every imaginable kind of an outfit are shown. 96 pages.

ELECTRICAL

104 **Electricity.** The Study of Its Laws for Beginners. N. H. Schneider.
105 **Dry Batteries.** How to Make and Use Them. N. H. Schneider.
106 **Electrical Circuits and Diagrams.** Direct Current. N. H. Schneider.
107 **Electric Bells and Burglar Alarms.** How to Install Them. N. H. Schneider.
108 **Modern Primary Batteries.** Their Construction and Maintenance. N. H. Schneider.
109 **Experimenting with Induction Coils.** Full of interesting experiments. H. S. Norrie.
110 **Small Accumulators.** How to Make Storage Batteries. P. Marshall.
111 **Simple Electrical Working Models,** and How to Make Them. P. Marshall.
112 **Electric Batteries.** How to Make and Use Them. P. Marshall.
113 **Telephones and Microphones.** How to Make Them. P. Marshall.
114 **Small Electrical Measuring Instruments.** How to Construct and Use Them.
115 **Electric Lighting for Amateurs.** P. Marshall.
116 **Small Dynamos and Motors.** How to Make and Use Them. F. E. Powell.
117 **Static Electricity.** Interesting Experiments for Everybody. P. G. Bull.
118 **Practical Electrics.** A Universal handbook on everyday electrical matters.
119 **The Wimshurst Machine.** How to Make and Use It. A. W. Marshall.
120 **Alternating Currents.** Simply explained in ordinary language.
121 **Inventions.** How to Protect, Sell and Buy Them. With the necessary forms and how to fill them out. By F. B. Wright. This book is especially written for inventors and those who are inexperienced.

THE ELECTRO IMPORTING CO.
233 FULTON ST., NEW YORK CITY

THE E. I. CO. NEWS

OFF THE PRESS

Fourth Annual Official

WIRELESS BLUE BOOK

And Radio Map of United States

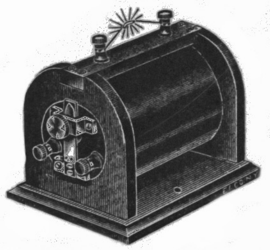
Containing all the Wireless Telegraph Stations, Including Ship Stations and Amateur Stations, their Call Letters, Locations, etc. Corrected to August 1, 1914. Published by the E. I. Co.
SEND FOR YOUR COPY TODAY

ONLY FIFTEEN CENTS PER COPY

REDUCED PRICES OF "ELECTRO" BULL-DOG SPARK COILS.

We manufacture to-day such huge quantities of our celebrated Bull-Dog Spark Coils, that we can turn them out a good deal cheaper than before. Look at the prices below and send your orders. You will be pleased indeed with E. I. Co.'s workmanship and E. I. Co.'s prices.

	New Prices.	Former Prices.
No. 4360 ¼ inch Coil, price Size 7½x4 5/16x6¼. Shipping weight, 4 lbs.	$2.00	$3.45
No. 1087 ½ inch Coil, price Size 7½x4 5/16x6¼. Shipping weight, 5 lbs.	$2.80	$4.00
No. 1088 1 inch Coil, price Size 7¾x5¾x6¼. Shipping weight, 6 lbs.	$4.00	$5.25
No. 4366 1½ inch Coil, price Size 8½x5¾x6¼. Shipping weight, 7 lbs.	$5.50	$7.50
No. 1089 2 inch Coil, price Size 8½x5¾x6¼. Shipping weight, 8 lbs.	$7.50	$9.75

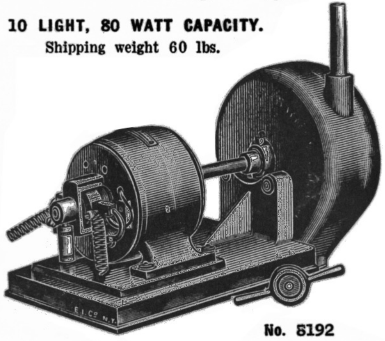


The "Electro" Hydro-Electric Lighting Plant

A complete Hydro-Electric plant, operating from your own water spigot, and similar in every respect to the mighty plants of this type, now in use throughout the United States and abroad.

Size over all 14 in. long by 7¼ in. wide by 11 in. high.

10 LIGHT, 80 WATT CAPACITY.
Shipping weight 60 lbs.



No. 8192

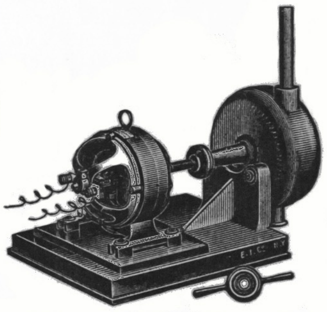
No. 8192 Hydro-Electric Lighting Plant, with spigot coupling. Price...$15.50

The "Electroport" Hydro-Electric Plant

Capacity—6 Volts, 4 Amperes on 60 lbs. Water Pressure

The outfit can be conveniently located near any sink so that the discharge water will pass directly into same. Of course the outfit can also be located in a room or anywhere else by providing an outlet for the water to run off.

No. 3193 Electroport Hydro-Electric Plant, as described, shipping weight 24 lbs. $8.00



No. 3193

New 1914 No. 14

Second Edition

Catalog Ready

Contains Lots of New Apparatus

ELECTRO
IMPORTING
COMPANY,

236 Fulton Street,
New York City.

I enclose herewith 10 cents in stamps or coin for which please send me your Miniature Wireless Detector and your Electric Cyclopedia for 1914, No. 14, 2nd edition, containing 400 illustrations and over 1600 articles and valuable information on Electricity and Wireless. Book also contains 20 free coupons for your 160 page wireless course in twenty lessons.

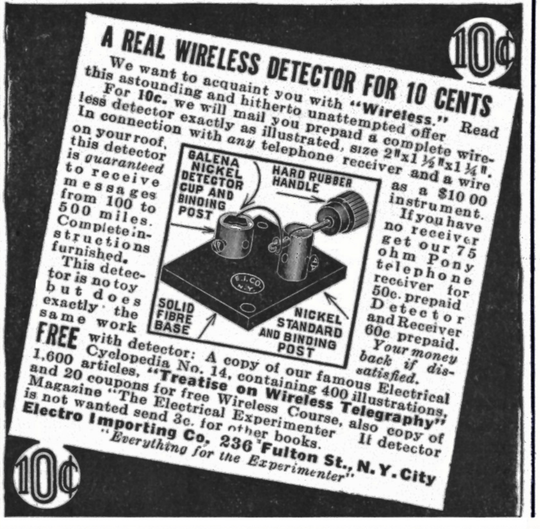
Tear off here and mail to our address. If you wish our Cyclopedia only send 3 cents instead of 10 cents.

Name..

Address.......................................

State...

Free Wireless Correspondence Course in Twenty Lessons by S. Gernsback, A. Lescarboura, and H. W. Secor, E. & R. Eng., with every order. See catalog for information.


10¢
GALENA NICKEL DETECTOR CUP AND BINDING POST
HARD RUBBER HANDLE
E. I. CO. N. Y.
SOLID FIBRE BASE
NICKEL STANDARD AND BINDING POST
10¢

A REAL WIRELESS DETECTOR FOR 10 CENTS

We want to acquaint you with "**Wireless.**" Read this astounding and hitherto unattempted offer

For **10c.** we will mail you prepaid a complete wireless detector exactly as illustrated, size 2"x1½"x1¼". In connection with *any* telephone receiver and a wire on your roof, this detector is *guaranteed* to receive messages from 100 to 500 miles. Complete instructions furnished.

This detector is no toy but does exactly the same work as a $10 00 instrument.

If you have no receiver get our 75 ohm Pony telephone receiver for 50c. prepaid Detector and Receiver 60c prepaid.

Your money back if dissatisfied.

FREE with detector: A copy of our famous Electrical Cyclopedia No. 14, containing 400 illustrations, 1,600 articles, **"Treatise on Wireless Telegraphy"** and 20 coupons for free Wireless Course, also copy of Magazine "The Electrical Experimenter" If detector is not wanted send 3c. for other books.

Electro Importing Co. 236 Fulton St., N. Y. City
"Everything for the Experimenter"

WAR

In Europe

don't affect our large stocks. We ship within 24 hrs. as in the past. 95 per cent of our goods are made in our factories in the United States.